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A REVISION OF THE GENUS *MEGAMELUS* IN AMERICA NORTH OF MEXICO (Homoptera, Fulgoridae, Delphacinae)

R. H. BEAMER

(Concluded)

Megamelus metzaria Crawford

Megamelus metzaria Crawford, 1914, U.S. Natl. Mus. 46:611.

MACROPTEROUS FORM. Resembling *Megamelus lobatus* Beamer but processes at apex of aedeagus from the same base, aedeagal brace with apex more acute and processes between inner lobes of ninth segment distinctly enlarged at apex. Length ♂ 4.8 mm., ♀ 5 mm.

Structure: Basal segment of antennae distinctly shorter than second; crown distinctly less than twice as long as apical width, carinae distinct but not sharp; elytra much longer than body, semihyaline with a brown spot before apex of clavus.

Color: General color stramineous, scutellum and portions of abdominal segments much darker.

Genitalia: Genital capsule in ventral view with outer lobes of ninth segment large, almost half as long as capsule; inner lobes about one-third as long as outer, widest at base, apices rounded about half as wide, a large knob-shaped process at base between them; styles widest at base, slightly narrowed to truncate apices with outer and inner corners sharp; aedeagal brace spatulate, long, weakly colored on each side of apex, making structure appear quite narrow; aedeagus long and narrow, curved ventrally at apex which is divided into two slender processes; anal segment without processes.

Types: Holotype ♂, Banner, Wyoming, in collection of Pomona College. The type, not too well preserved, was studied and found to be identical with the specimen figured here except in the shape of the apex of the styles. The left style was absent entirely and the right was atypical for the whole genus in that the apex narrowed to a sharp point on the outer margin (fig. 16b). It is possible it was due to parasitism or some other cause. If at some future date specimens collected at Banner, Wyoming, should definitely prove *Megamelus metzaria* to be a different species, then the one figured here as *metzaria* can be given a new name. Many specimens studied, Douglas County, Kansas; 2 ♂ ♂ Cheboygan, Michigan.

BRACHYPTEROUS FORM. Like the macropterous form except with nonflight wings.

Types: Holomorphotype ♂, allomorphotype ♀, and 5 ♂ and 3 ♀ paramorphotypes: Meade County, Kansas, September 13, 1944, R. H. Beamer; other paramorphotypes: Lawrence, Kansas, August 23, 1944, R. H. Beamer; 2 ♂ ♂ Douglas County, Kansas, November 6, 1944, R. H. Beamer; 1 ♂ Douglas County, Kansas, October 2, 1945, R. H. Beamer; 1 ♂ Meade

County, Kansas, September 9, 1944, R. H. Beamer; 1 ♂ Sterling, Kansas, August 4, 1944, R. H. Beamer; 1 ♂ Montauk, Long Island, New York, August 17, 1946, L. D. Beamer; 2 ♂ ♂ Douglas County, Kansas, August 8, 1945, R. H. Beamer; 1 ♂ Wichita, Kansas, June 20, 1946, R. H. Beamer; 1 ♂ Hutchinson, Kansas, June 18, 1949, R. H. Beamer; 1 ♂ same place, July 28, 1950, L. D. Beamer; 1 ♂ Durham, New Hampshire, August 12, 1946, R. H. Beamer.

Types in the Snow Entomological Museum.

Megamelus paleatus (VanDuzee)

Stenocranus paleatus VanDuzee, 1897, Bull. Buffalo Soc. Nat. Sci., p. 232.

MACROPTEROUS FORM. This is the largest species in Florida and perhaps the most common. Length ♂ 5 mm., ♀ 5.5 mm.

Structure: Basal segment of antennae slightly shorter than second; crown almost three times as long as apical width, projecting almost one half its length in front of eyes, carinae sharp and high; elytra long, projecting almost one-third their length beyond abdomen.

Color: General color yellowish brown, mottled with darker, especially a spot before apex of clavus and veins of elytra much darker, also genital capsule, legs, and various ventral sclerites spotted with almost black.

Genitalia: Genital capsule in ventral view almost spherical; lateral lobes of the ninth segment large, half as long as entire capsule, widest on caudal end; inner lobes short and narrow, about one-fourth as long as outer, small raised tooth between them; styles with apices truncate enlarged on both outer and inner corners; aedeagal brace almost circular; aedeagus very short, tubular, scarcely more than half as long as genital capsule, with a short curved process arising on margin of apex; anal segment without processes.

Types: Holotype ♀ from Florida in collection at Iowa State College, Ames, Iowa.

Neoallotype ♂ described here, Red Level, Florida, July 6, 1948, R. H. Beamer. In the Snow Entomological Museum.

Numerous specimens are at hand from many localities in Florida, Texas, and Louisiana. The Texas specimens were taken on *Pontedera cordata* in Bastrop State Park, in May, 1954.

BRACHYPTEROUS FORM. Resembling the macropterous form but lighter in color, elytra barely longer than wide, extending only to second abdominal segment.

Types: Holomorphotype ♂, allomorphotype ♀, 11 ♂ and 7 ♀ paramorphotypes: Palatka, Florida, March 10, 1947, R. H. Beamer. Types in the Snow Entomological Museum. Between 300 and 400 long-winged specimens examined, mostly from Florida. Specimens were compared with the type in Ames, Iowa, and declared identical by Jean Lafoon in 1952.

Megamelus hamatus n. sp.

BRACHYPTEROUS FORM. Resembles *Megamelus paleatus* (VanDuzee) but aedeagus flat instead of cylindrical with apex narrowed into a sword-shaped process that projects from tip of shaft almost at right angles. Length ♂ 3 mm., ♀ 3.5 mm.

Structure: Calcar about as long as first tarsal segment and twice as wide; first antennal segment definitely shorter than second; crown slightly more than twice as long as apical width, projecting in front of eye almost half its length; elytra reaching to second abdominal segment, apices broadly rounded.

Color: General color light brown, lateral fovea of crown dark, lateral angles of scutellum, two spots on apices of each elytra, pustules on dorsum of abdomen, spot beneath each eye and narrow crossband at apex of clypeus white.

Genitalia: Genital capsule in ventral view wider than long; outer lobes on ninth segment broad, more than half as long as capsule; inner lobes more than half as long and more than half as wide as outer; styles widest at base, narrowed to broadly rounded outer corner and a sharply curved inner corner; aedeagal brace broadly and shallowly excavated at apex; aedeagus short, flat, blade-like, apex narrowed to a sword-shaped, curved process projecting ventrally at right angles to shaft.

Types: Holotype ♂, allotype ♀, 2 ♂ and 11 ♀ paratypes, Woodbridge, Virginia, August 28, 1946, R. H. Beamer; other paratypes: 1 ♂ and 2 ♀ ♀, same place and time, L. D. Beamer; 5 ♂ ♂ and 17 ♀ ♀ Plummers Island, Maryland, August 3, 1913, W. L. McAtee; 1 ♀ August 15, 1 ♀ October 5, same year, place, and collector.

Types and paratypes in Snow Entomological Museum; paratypes in United States National Museum.

Megamelus distinctus Metcalf

Megamelus distinctus Metcalf, 1923, Jour. Elisha Mitchell Sci. Soc., 38:201.

BRACHYPTEROUS FORM. Resembling *M. lobatus* but aedeagus not bifid at apex. Length ♂ 3 mm., ♀ 3.12 mm.

Structure: Basal segment of antennae slightly shorter than second; crown more than twice as long as apical width, projecting about one-third its length in front of eyes; elytra about as wide as long, apices truncate.

Color: General ground color whitish to dark brown, quite variable; some specimens almost dark brown all over, others quite light throughout.

Genitalia: Genital capsule in ventrocaudal view with outer lobes of ninth segment about one-fourth as long as capsule, about half as wide as long, rather sharp on caudal end; inner pair not quite half as long as outer, about twice as wide at base as on outer two-thirds, apices rounded; styles with avicephaliform apices; aedeagal brace with apex truncate to somewhat bilobed; aedeagus long, curved ventrally at base and again on outer third with a short stout spur on right side of shaft near end of basal curve; anal segment without processes.

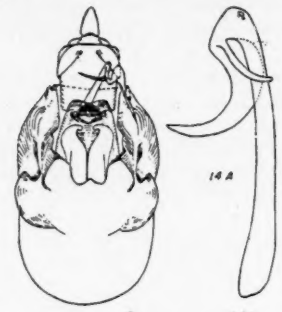
Types: Holotype ♂, in collection of Z. P. Metcalf. Specimens examined from Kansas, Illinois, Connecticut, New York, and Michigan.

Megamelus toddi n. sp.

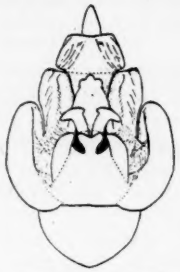
MACROPTEROUS FORM. Resembling *M. paleatus* VanDuzee but smaller, darker brown and having the aedeagus tapered from tip to base instead of parallel-sided. Length 4 mm.

Color: General color brown. Elytra hyaline with fuscous spot on apices of clavi. Dorsum of thorax dark brown.

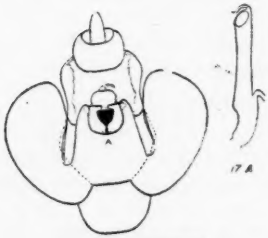
Genitalia: Genital capsule in ventral view with outer lobes of ninth segment rather short, slightly wider and of about same length as inner pair, with a third pair between these longer and narrower than either. Apices of



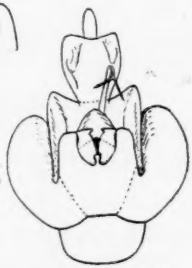
14. MEGAMELUS FALCATUS



15. MEGAMELUS CORONUS

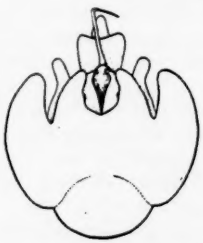


17. MEGAMELUS PALEATUS



16. MEGAMELUS METZARIA

18. MEGAMELUS HAMATUS



20. MEGAMELUS TODDII

19. MEGAMELUS DISTINCTUS

styles avicephaliform. Aedeagal brace indefinite, more or less spatulate. Aedeagus about half as long as capsule, tapered from base to apex, base several times wider than apex, fairly slender on outer two-thirds, about outer one-third recurved at less than a right angle. Anal segment without spurs or teeth.

Holotype ♂, allotype ♀, 1 ♀ and 15 ♂ paratypes: Hammond, Louisiana, June 22, 1948, E. L. Todd. Types in the Snow Entomological Museum.

Key to the Species of *Megamelus*

1.	Male anal segment with processes	2
	Male anal segment without processes	5
2.	Anal processes projecting anteriorly	3
	Anal processes projecting posteriorly	*davisi*
3.	Apices of aedeagal brace turned ventrad	4
	Apices of aedeagal brace not turned ventrad	*lunatus*
4.	Aedeagus with a large sword-like process near base	*notulus*
	Aedeagus without such a process near base	*flavus*
5.	Aedeagel brace deeply split or excavated at apex	6
	Aedeagal brace not deeply split or excavated at apex	12
6.	Sides of excavation with processes	7
	Sides of excavation without processes	8
7.	With processes on inside of arms of excavation	*aestus*
	With processes on outside of arms of excavation	*ungulatus*
8.	Sides of excavation almost touching	*bifidus*
	Sides of excavation not almost touching	9
9.	Sides of aedeagel brace sharply recurved on outer third, apex sharp	*recurvatus*
	Sides of aedeagal brace not sharply recurved, apices not sharp	10
10.	Aedeagus trifid at apex	11
	Aedeagus not trifid at apex	*gracilis*
11.	Sides of aedeagal brace flat, bifid at apex	*trifidus*
	Sides of aedeagal brace curved dorsally at tip, not bifid	*longicornis*
12.	Lobes at sides of styles bifid	*inflatus*
	Lobes at sides of styles not bifid	13

PLATE III

14. *Megamelus falcatus;* ventral view of genital capsule of male; 14a, lateral view of aedeagus, enlarged.
15. *Megamelus coronus,* ventral view of genital capsule of male; 15a, lateral view of aedeagus, enlarged.
16. *Megamelus metzaria,* ventral view of genital capsule of male; 16a, lateral view of aedeagus, enlarged; 16b, tip of style of holotype.
17. *Megamelus paleatus,* ventral view of genital capsule of male; 17a, lateral view of aedeagus, enlarged.
18. *Megamelus hamatus,* ventral view of genital capsule of male; 18a, lateral view of aedeagus, enlarged.
19. *Megamelus distinctus,* ventral view of genital capsule of male; 19a, lateral view of aedeagus, enlarged.
20. *Megamelus toddi,* ventral view of genital capsule of male; 20a, lateral view of aedeagus, enlarged.

13. Apex of aedeagus bifid 14
    Apex of aedeagus not bifid 17
14. Bifid apex of shaft recurved 15
    Bifid apex of shaft not recurved ..... *lobatus*
15. Processes at apex of aedeagus about same width 16
    One process at apex of shaft much longer than other ..... *falcatus*
16. Apex of aedeagal brace trilobed ..... *coronus*
    Apex of aedeagal brace more or less pointed ..... *metzaria*
17. Aedeagus long, cylindrical or flat 18
    Aedeagus short, tubular, with sinuate process at apex 19
18. Aedeagus flat, apical third sharply narrowed, bent at almost right angles to shaft ..... *hamatus*
    Aedeagus long and narrow with a heavy short process near base ..... *distinctus*
19. Aedeagus tapering from base to tip ..... toddi
    Aedeagus not tapering from base to tip ..... *paleatus*

ADDENDUM

In a previous article (One Old and Five New Species of Delphacine Fulgorids, Jour. Kansas Ent. Soc., 25: 111-115, 1952) the specific names of drawings 2 and 3 on page 113 were interchanged. The correct names are: 2. *Sogata meridiana;* and 3. *Sogata dorsolineata.*

RECORDS OF *MACRONOCTUA ONUSTA* GROTE, THE IRIS BORER, IN NEBRASKA (Noctuidae, Lepidoptera)

E. W. HAMILTON
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On April 25, 1952, a caterpillar from Lincoln, Nebraska, was brought in to the University of Nebraska, Entomology Department, and tentatively identified as *Macronoctua onusta* Grote. The identification was corroborated by a specialist of the Division of Insect Identification, Bureau of Entomology & Plant Quarantine. A previous departmental record shows the iris borer was also reported in Washington County, April 17, 1924. In both instances the caterpillars were found on iris bulbs. A search of the literature has shown no previous record of *M. onusta* being reported west of the Mississippi River up to 1953.

TWO NEW DIPTERA FROM THE PACIFIC COAST STATES

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Pullman, Washington

The present paper gives descriptions of two new Diptera, both from the Pacific Coast states and belonging to groups which have been given a comprehensive review within approximately the past decade. Descriptions are presented at this time chiefly in order to validate the names for use in other publications.

Family STRATIOMYIDAE

Stratiomys currani boharti, n. sp.

This subspecies differs from the typical form in that the abdominal sterna are distinctly black-banded basally and the femora, in the females as well as in the males, are black except for their apices and very narrow bases. The black basal bands of the venter may occupy half or more of the respective sternum, as commonly is the case on segments 1 and 4, or may be very narrow and sometimes interrupted, as on segment 2.

Holotype female, Sierraville, 12 miles southeast, Sierra Co., California, July 4, 1953 (R. M. Bohart); from the collection of the University of California, Davis, to be placed in the California Academy of Sciences. *Allotype* male, same data. *Paratypes*, 6 females, 16 males, same data; 2 females, 2 males, Truckee, Nevada Co., California, July 5, 1953 (R. M. Bohart); 3 females, 1 male, King's Beach, 6 miles northwest, Placer Co., California, July 5, 1953 (R. M. Bohart); 1 female, 1 male, 6 miles west of Lakeview, Oregon, 5100 ft., July 8, 1937 (Bolinger, Jewett).

This form appears to be a well-marked subspecies in the Sierras and the Cascades, but it intergrades broadly with the typical form (described from southwestern Colorado and common in Utah) over an area ranging from lower altitudes in California, through Wyoming, into Utah. For example, in two females from Bishop, California, and from Yellowstone National Park, Wyoming, the abdominal sterna are narrowly black basally and the subapical half of each femur is black. An occasional Utah female shows a tendency toward blackening on the femora. The blacker character of the Pacific Coast form does not seem to be an expression of the melanistic tendency shown by some other members of this subfamily when they occur in the moist, cool habitats of high mountains, since the typical paler Colorado form also comes from the high mountains. Because of this and the distinctive character of the two forms which appear to be the extremes of a cline, it should be of value to give them distinctive subspecific names.

Family OMPHRALIDAE

Omphrale whittakeri, n. sp.

Related to *O. beameri* Hardy and *O. mirabilis* (Adams). The male traces to *O. mirabilis* in Hardy's key (Jour. Kansas Ent. Soc. 17:42–43, 1944) but

differs from that species in the darker wing veins and in the genitalia (fig. 1); the female traces to *nubilipes* (Say). This species fits the description of *O. mirabilis* given by Hardy (*l. c.*, p. 47), with the following exceptions and clarifications.

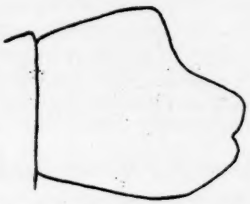

Fig. 1. *Omphrale whittakeri*, n. sp. Ninth tergal plate of male, view slightly lateral to dorsal.

Male. Antennal flagellum about three times as long as wide. Tarsi yellowish, darkened toward the apex; basitarsus equal in length to the following three tarsomeres combined on the front and middle, and to the remaining four tarsomeres on the hind tarsus. Wing veins yellow toward the costal margin and the wing base, otherwise brown. Halteres white. Sclerotized areas of third to fifth abdominal terga reduced to a pair of triangles at the posterior corners, connected by an almost evanescent apical plate, on each; conjunctival areas strikingly white, as in related species. Ninth tergal plate (fig. 1) similar to that of *mirabilis* but with its dorsal extension broader, the slight apical notch more toward the inner margin.

Female. Stalk of halter and upper half of knob strongly infuscated.

Holotype male, Hanford Works, Benton Co., Washington, sagebrush, 640 ft., May 6, 1952, Ss8-5 (R. H. Whittaker); in the State College of Washington collection, type no. 176. *Allotype,* female, same data but July 30, Sc20-22. *Paratypes,* same data as type, except as follows: 2 males, May 15, S3s9-1; 1 male, May 12, S2s8-12; 1 male, May 14, Ss9-19; 1 male, May 6, Ss8-5; 1 male May 6, Ss8-11; 1 male, May 20, Ss10-2; 1 male, May 27, Ss11-15; 1 male, July 23, Ss19-1; 1 male, July 30, Ss-20-2; 1 male, July 30, Ss20-3; 1 female, July 30, Ss20-4.

NORTH AMERICAN TACHINID FLIES OF THE GENUS *WAGNERIA* (DIPTERA)[1]

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College Station, Texas

The present study was undertaken to determine the status of the North American species assigned to *Wagneria*. The genus was first proposed by Robineau-Desvoidy with *W. gagatea* new (equals *Ocyptera costata* Fallen) as the type and only species. As previously pointed out by Coquillett (Proc. U. S. Natl. Mus., 37:619, 1910), *Wagneria* is therefore monobasic and other species assigned here must be considered in the light of subsequent interpretations of the generic characters by various authors. In keeping with the time, the original description of the European type species is brief and omits pertinent details currently considered essential for satisfactory comparative classification. Consequently the nearctic congeners have been passing under various combinations. As considered by Curran (Can. Ent. 60:48, 1928) *Wagneria* included eleven species, which previously had been assigned to six different genera, viz., *Phorichaeta, Metachaeta, Micromintho, Metallicomintho, Wagneria* and *Pachynocera*. Of these, the last mentioned genus is neotropical and falls outside the scope of this paper; however, the nearctic genus *Polideosoma*, which was omitted from consideration, is undoubtedly a member of the present complex. According to Townsend (Manual of Myiology, 1936, 1939, 1940) *Phoricheta* (=*Metachaeta*), *Micromintho* (=*Metallicomintho*), *Wagneria* and *Polideosoma* are valid genera; the first two belonging to Eriothrixiini and the last two to Actiini. His recharacterization of *Wagneria* (*loc. cit.*) agrees substantially with the series of the type species which was recently examined in the Fallen and Zetterstedt collections. However, Townsend overlooked the setose propleura, omitted mention of the bare first vein and cited one or two scutellar discals instead of the four or five pairs actually present in *costata*.

In the material available for this study twelve species of *Wagneria* distinguishable by adult characters are included in the accompanying key. These species, however, do not appear to constitute a natural genus. There are decisive differences in the puparia. The structural details of the stigmata may vary from a common or simple type in which each spiracular plate contains three small curved slits (as typified by *helyma*) to a strongly tuberculate type in which the slits are larger and more widely separated by rugose areas (as exemplified in *major* and *vernata*). The adults of these species show no corresponding differences in any characters currently considered of generic importance. The significance of the puparial differences in the present complex cannot be evaluated for taxonomic purposes at this time since reared material, with associated immature stages, is available in less than half of the known forms. Rearings of species belonging to this complex are most commonly recorded from phalaenid or noctuid hosts but apparently none has been encountered in very large numbers. Hence, only through patient and systematic accumulation

[1] Contribution No. 1960, from the Department of Entomology, Texas Agricultural Experiment Station.

of materials, which supply the presently lacking information, can a truly natural classification of the adults be determined.

I am indebted to Curtis W. Sabrosky for the loan of material and more especially for notes which aided greatly in establishing the identity of several types concerned, which are now located in Eureopean Museums. Types of the new species described below are in the U.S. National Museum and in my collection.

Genus *Wagneria* Robineau-Desvoidy

Wagneria Robineau-Desvoidy, 1830, Essai Myodaires, p. 126 (type *Ocyptera costata* Fallen, as *W. gagatea*, new species); Coquillett, 1910, Proc. U. S. Natl. Mus. 37:619; Curran, 1928, Can. Ent. 60:48; Wainwright, 1928, Trans. Ent. Soc. London 76:201; Townsend, 1936, Manual of Myiology, pt. 4, pp. 137, 143; 1940, pt. 10, pp. 273-274.

Scopolia Robineau-Desvoidy, 1830, Essai Myodaires, p. 268.
Periscepia Gistel, 1848, Naturges. Thierr. 10:11.
Phoricheta Rondani, 1861, Dipt. Ital. Prodr. pp. 4, 8.
Ramonda Robineau-Desvoidy, 1863, Hist. Nat. Dipt. 1:790.
Carbonia Robineau-Desvoidy, 1863, Hist. Nat. Dipt. 1:806.
Stephania Robineau-Desvoidy, 1863, Hist. Nat. Dipt. 1:807.
Aleria Robineau-Desvoidy, 1863, Hist. Nat. Dipt. 1:809.
Ocalea Robineau-Desvoidy, 1863, Hist. Nat. Dipt. 1:810.
Petinops Brauer & Bergenstamm, 1891, Denkschr. Kais. Akad. Wiss. 58:356.
Metachaeta Coquillett, 1895, Jour. New York Ent. Soc. 3:98.
Eutricogena Townsend, 1915, Proc. Biol. Soc. Washington 28:23.
Polideosoma Townsend, 1915, Jour. New York Ent. Soc. 23:226; 1940, Manual of Myiology, pt. 10, p. 253.

The genus as here provisionally constituted includes small to average-sized shining black flies which possess the following characters among others:

Head distinctly wider than high; facial profile moderately to strongly receding and subequal to length of frontal; antennal axis nearly at eye middle; vibrissae on oral margin; facialia bare; parafacialia moderately wide, bearing a row of infraclinate bristles; clypeus moderately depressed; epistoma in clypeal plane; front wide in both sexes, vertex about two-fifths head width; one to two frontals below antennal base; ocellars divaricate, more or less proclinate; two to three proclinate orbitals in both sexes; antennae usually approximating length of face; arista bare, proximal segments short to moderately elongate; cheek one-third to one-half eye height; eyes bare; proboscis short, labella large; palpi well developed. Prosternum bare; propleura and postnotal slopes usually bare; postsutural dorsocentrals three; sternopleurals two or three; pteropleural not developed; scutellum with two lateral, one apical and one to four or more pairs of erect discal bristles. Tarsal claws and pulvilli shorter than apical tarsal segment in both sexes; fore tarsi in female somewhat widened. Wings more or less infuscated costally; first vein normally bare; petiole of first posterior cell usually exceeding one-half length of apical cross vein; costal spine strong; calypters rather small, hind lobe about as wide as long; postscutellum normally developed. Abdomen longer than thorax and nearly as wide as same; first segment without median marginals, second with one pair, third and fourth each with a marginal row; sternites covered; female genitalia not adapted for piercing. Length, 5-7.5 mm.

Key to Species

1. Prosternum bare; petiole of first posterior cell reaching costa well before wing tip 2
   Prosternum setulose; petiole of first posterior cell reaching costa near wing tip; first vein setulose; last section of fifth vein one-half as long as preceding section, N. A., widespread ..... *Micromintho melania* Townsend
2. Propleuron bare ..... 4.
   Propleuron distinctly setose ..... 3.
3. Frontalia two-fifths vertex width; third vein setulose beyond small cross vein; last three abdominal segments pollinose on basal third, B. C. to Quebec ..... *Wagneria polita* (Brooks).
   Frontalia three-fifths vertex width; third vein setulose to small cross vein; last three abdominal segments pollinose on basal fourth, northern U. S. and Canada ..... *W. clesides* (Walker).
4. Petiole of first posterior cell at least three times longer than small cross vein ..... 5.
   Petiole of first posterior cell at most one and one-half times small cross vein; palpus yellow; second aristal segment elongate, Labrador ..... *W. labradorensis* (Brooks).
5. First vein bare, at most with one or two adventitious hairs; second aristal segment short ..... 6.
   First vein strongly setulose; second aristal segment in male two to three times longer than wide; scutellum with two pairs of erect discals, one before and one behind middle of disk; wing infuscate on costal border, N.A., widespread ..... *W. laevigata* (van der Wulp).
6. Scutellum without preapical bristles or erect discals behind middle. ..... 12.
   Scutellum with preapicals or erect discals on apical half ..... 7.
7. Abdominal segments two and three with discals ..... 11.
   Abdominal segments two and three without discals ..... 8.
8. Arista black on thickened base ..... 9.
   Arista and second antennal segment largely or wholly bright reddish yellow, U.S., widespread ..... *W. vernata* West.
9. Parafrontal pruinose; third vein setulose to small cross vein or nearly so ..... 10.
   Parafrontal wholly polished or shining black; third vein setulose well beyond small cross vein; ocellar triangle large, extending about to mid front, western U. S. ..... *W. ocellaris*, n. sp.
10. Cheek two-fifths eye height; arista thickened on basal fourth or less, northeastern U.S. and Canada ..... *W. cornuta* Curran.
    Cheek three-fifths eye height; arista thickened on basal third, southern U. S. ..... *W. major* Curran.
11. Sternopleurals three; scutellum with a pair of preapical bristles and usually two or more irregular pairs near middle of disk, northern U.S. and Canada ..... *W. pacata*, n. sp.

Sternopleurals two; scutellum without preapicals and bearing only two pairs of erect discals, one at or slightly behind middle of disk and one in front near basal margin, N. A., widespread ..... *W. helyma* (Walker).

12. Antenna at most three-fourths facial length, slender straight third segment conspicuously reddish at base, three to four times longer than second; mesonotum (female) distinctly though thinly pollinose, western U.S. ..... *W. cinerosa* (Coquillett).

Antenna as long as face, third segment (male) elongate and concave on front edge, six to seven times longer than second; mesonotum (female) wholly polished or without pollen, western U.S. ..... *W. rohweri* (Townsend).

Micromintho melania Townsend

Micromintho melania Townsend, 1919, Proc. U. S. Natl. Mus. 56:554-555; 1939, Manual of Myiology, pt. 9, pp. 193-194.
Metallicomintho abdominalis Townsend, 1919, Proc. U. S. Natl. Mus. 56:555-556; 1939, Manual of Myiology, pt. 9, pp. 193-194.
Metachaeta cinerosa Reinhard, 1923, Ent. News 34:268-269.
Wagneria distincta Curran, 1928, Can. Ent. 60:48.
Wagneria abdominalis Curran, 1928, Can. Ent. 60:48.
Micromintho cinerosa (Reinhard) Brimley, 1938, Insects of North Carolina, p. 365.

The present species is not a member of the *Wagneria* complex but approaches it in general anatomical features and is included here for comparative purposes. The above listed synonymy indicates the currently accepted status of this interesting and frequently misidentified species.

The type specimen of *melania* is a minute shiny black fly with a white fasciate abdomen; it was described (male only) from Globe Hills, Arizona. *Abdominalis,* also from Arizona, is the opposite sex of the same species. It differs from the *melania* male, aside from sexual characters, mainly in lacking abdominal pollen and averaging slightly larger in size. *Cinerosa* is not separable from *melania,* and *distincta,* which was proposed as a new name for *cinerosa,* also disappears from the list of valid names.

Melania is widespread in North America, ranging from Arizona to Alberta, Canada, and New England.

Wagneria clesides (Walker)

Tachina clesides Walker, 1849, List Dipt. 4:757.
Tricogena setipennis Coquillett, 1897, Rev. Tachin., p. 130; Aldrich, 1905, Cat. N. A. Dipt., p. 477.
Eutricogena clesides (Walker) Townsend, 1915, Proc. Biol. Soc. Washington 28:23; West, 1928, New York State List, p. 818 (*Eutrichogena*); Brimley, 1938, Insects of North Carolina, p. 365 (*Eutrichogena*).
Neophorichaeta johnsoni Smith, 1915, Psyche 22:100.
Peteina ontario Curran, 1926, Can. Ent. 58:87.

Although averaging a little larger in build, the habitus of the present species conforms quite closely with the other forms herein assigned to *Wagneria.* Hitherto *clesides* has been excluded from the genus perhaps chiefly because of the haired propleura. However, since the genotype (*costata*) also has setose propleura, it might appear expedient to include only the forms which agree

in this respect. This procedure would exclude all known North American species except the present and following one. However, there are several old world forms, considered congeners, that have setose propleura. The character is therefore not regarded as one of generic significance by current European authorities. This conclusion is provisionally accepted here pending the accumulation of more complete information regarding the biologies of the known forms.

The principal distinguishing items of *clesides* are included in the accompanying key. It may be added that the petiole of the first posterior cell is variable in length but averages consistently much shorter than in the remaining forms except the two following species. Also, in common with the latter, the hind cross vein is deeply concave immediately beyond the cubitulus and the second aristal segment is moderately elongate.

Clesides ranges across the North American continent through southern Canada and northern United States.

Wagneria polita (Brooks)

Eutricogena polita Brooks, 1945, Can. Ent. 77:92.

The species like the preceding has setose propleura but is described as differing in a number of minor items aside from the distinctions listed in the key.

The differentiating items, as taken from the original description, may be briefly summarized as follows: Wings darker, the veins more broadly bordered with brown; petiole of first posterior cell very short or about equal to length of small cross vein; hind cross vein strongly bent inwards; second aristal segment over twice as long as broad; mesonotum very thinly pollinose with a decided bluish shade; abdomen highly polished bluish black, silvery gray pollinose on anterior third of segments two, three and four.

A boreal form ranging from Quebec to British Columbia. The type series, which I have not seen, is in the Canadian National Collection.

Wagneria labradorensis (Brooks)

Petinops labradorensis Brooks, 1945, Can. Ent. 77:92-93.

The essential details of the species are listed in the original description, which is readily accessible, and need not be repeated here. As in the preceding species, the wing venation provides the most obvious distinction in this boreal form; the petiole of the apical cell is much shorter than in most allied forms and measures less than twice the length of the small cross vein.

The type series, including two males and one female, from Hopedale, Laborador, is in the Canadian National Collection. No additional material has been recorded and no information is available concerning host relationships.

Wagneria laevigata (van der Wulp)

Rhinophora laevigata van der Wulp, 1890, Biol. Cent. Amer. 2:205.
Metachaeta atra Coquillett, 1895, Jour. New York Ent. Soc. 3:98; West, 1928, New York State List, p. 817.
Metachaeta helymus Coquillett (nec Walker), 1897, Rev. Tach., p. 126; Aldrich, 1905, Cat. N. A. Dipt., p. 475; 1915, Ann. Ent. Soc. Amer. 8:83; Gahan, 1915, Proc. Ent. Soc. Washington 17:24; Greene, 1921, Proc. U. S. Natl. Mus. 60:21.

Wagneria helymus Curran (nec Walker), 1928, Can. Ent. 60:48; Schaffner and Griswold, 1934, U. S. D. A. Misc. Publ. No. 188, p. 124.
Wagneria carbonaria Aldrich (nec Panzer), 1931, Proc. U. S. Natl. Mus. 80:14.
Phoricheta atra (Coquillett) Townsend, 1936, Manual of Myiology, pt. 4, p. 143.

Considerable confusion has existed concerning the identity of this species. A recent study of the type, now in the British Museum, discloses that the first vein of the wing is setulose, although this fact is not mentioned in Wulp's original description. The latter, based upon material from Vera Cruz, Mexico, seems to have been overlooked, or at least not recognized, as a member of the present species complex by most American workers.

Coquillett considered the character of bare or setulose first vein of wing as one of generic importance. This character is apparently quite stable and useful in other sections of the family but in the present group it is variable and of no generic significance. In the material available for study, the variations noted were all among the species which normally have the first vein bare. In this section of the complex occasional specimens bear one to several adventitious hairs on the median part of the first vein. Aside from the distinctly setulose first vein, the present species differs from most of its congeners in having the second aristal segment more elongated in the male and the female fore tarsi are not so noticeably flattened or widened.

The species ranges from Guatemala northward to Canada and has been most frequently reared from the armyworm, *Cirphis unipuncta* (Haw.). Other records of noctuid hosts in the U.S. National Museum include: *Euxoa auxiliaris* (Grt.); *Graptolitha* sp.; ? *Lascoria ambigualis* (Wlk.); *Elaphria nucicolora* (Gn.) and unidentified cutworms.

Wagneria vernata West

Wagneria vernata West, 1925, Jour. New York Ent. Soc. 33:127; Curran, 1928, Can. Ent. 60:48; Rowe, 1932, Ent. News, 43:234; Schaffner and Griswold, 1934, U. S. D. A. Misc. Publ. No. 188, p. 124; Fattig, 1949, Emory Univ. Mus. Bull. No. 8, p. 35.
Phorichaeta vernata (West), 1928, New York State List, p. 818.

The bright reddish yellow second antennal segment and arista readily distinguish the species. It was described from New York and ranges south to Georgia and westward to Idaho and California. Information regarding the host relationships of the species is limited. Schaffner and Griswold (loc. cit.) reared it from *Orthosia hibisci* Grt. Although four adults were reared, the determination of the parasite is questioned by these authors. According to unpublished records in the U.S. National Museum, *vernata* has been reared from the additional noctuid hosts, *Protorthodes oviducta* Gn. and *Xylena* sp. in New Jersey. The type series is in the Cornell University Collection.

Wagneria major Curran

Wagneria major Curran, 1928, Can. Ent. 60:48.

Three males from the type locality, Washington County, Arkansas, are in my collection. These agree with the original description in most details but the third antennal segment measures nearly three and one-half times the length of the second and the cheek three-fifths or more the eye height. The infrasquamal setulae are sparse and at times reduced to a single minute inconspicuous hair.

Besides the types series, the U.S. National Museum contains four specimens from Melrose Highlands, Massachusetts, and A. & M. College, Mississippi. The Mississippi material was reared by Allen from *Choephora fungorum* G & R.

Wagneria cornuta Curran

Wagneria cornuta Curran, 1928, Can. Ent. 60:49.

Similar to the preceding species from which it is most readily distinguished by the items listed in the accompanying key. Material examined includes one female labeled "Oromocto, N.B., 9, VII, 13, paratype" in the Canadian National Collection. As mentioned in the description, this specimen bears a pair of erect discals on each intermediate abdominal segment. It does not represent the opposite sex of the holotype male. The following material in my collction, one female from Stamford, Connecticut, two males from Amherst, Ohio, and one male from Melrose Highlands, Massachusetts, (type locality) all lack abdominal discals and agree in this respect with the holotype. The latter, which I have not seen, is in the Canadian National Collection. The host relationships are not known.

Wagneria ocellaris, n. sp.

Similar to the preceding species, differing chiefly as follows:

MALE. Front at vertex 0.38 of head width; frontal vitta black, subequal parafrontal width; ocellar triangle considerably enlarged and extending about to middle of front, bearing a pair of well developed proclinodivergent bristles; palpus spatulate, normally black but sometimes reddish apically; cheek one-third eye height; sternopleurals two or three; wing brownish hyaline, slightly darker on costal margin; first vein usually bare but sometimes with several adventitious hairs on median section; third vein setulose to well beyond small cross vein; cubitulus generally with a short stump; costal spine inconspicuous, rarely attaining length of small cross vein; abdomen shorter, segments two and three normally without discals and fourth with one discal row behind middle; genital forceps short, united, bowed forward and tapered to an acute tip.

FEMALE. Vertex 0.39 of head width; antennae considerably narrower and the fore tarsi flattened and distinctly widened with shorter claws and pulvilli than in male. Length, 5-6 mm.

Holotype male, Cayuse, Oregon, May 13, 1938 (K. Gray & J. Schuh) and allotype female, Monrovia Canyon, California, March 27, 1932 (C. H. Martin). Paratypes: 1 male, St. Helens, Ore., May 21, 1938 (K. Gray & J. Schuh); 1 male, same locality as allotype, April 6-9, 1939, no collector's label; 2 males, Mt. Diablo, Cal., April 1, 1952 and Sequoia Natl. Pk., Ash Mt., Cal., April 26, 1951 (E. I. Schlinger); 1 male, Quincy, Plumas Co., Cal., July 13, 1949 (A. S. Deal); 1 male, Clear Creek, Cuyama Co., Cal., March 23, 1940 (R. G. Dahl); 2 males, "Mts. near Claremont, Cal. Baker"; 1 male, Glennville, Kern Co., Cal., April 22, 1950 (R. M. Bohart); 1 female, "Bishopp, Cal., April 24, 1950"; 1 male, Mt. Home Canyon, S. Bernardino Mts., Cal., June 8, (J. M. Aldrich); 2 males, Alum Rock Pk., Santa Clara Co., Cal., April 21, 1951 (J. W. MacSwain); 2 males, Chester, Cal., July 7, 1948 (D. J. & J. N. Knull); 3

males, "Gold Hill, Ida. July 27, 1927", "Kendrick, Ida." and "woods near Reuben, Ida. June 14, 1909" all collected by J. M. Aldrich; 1 male, Dartford, Wash., June 28, 1930 (J. M. Aldrich) and 1 male, labeled "Ft. Douglas" without additional data.

The St. Helens, Oregon, specimen has a pair of well developed discals on the third abdominal segment and may represent a different species. The other characters, however, except the presence of 3 or 4 hairs on wing vein one, agree closely with the items listed for the remainder of the series.

Wagneria pacata, n. sp.

MALE. Front at vertex 0.37 and at antennal base 0.52 of head width; parafrontals mostly shining black; frontal vitta deep red, narrower than parafrontal; ocellar plate polished, bearing a pair of weak divaricate bristles; orbitals two proclinate and one reclinate; verticals two pairs, outer nearly as long as inner; frontals in a single row stopping at ocelli, two bristles beneath antennal base; antennae black, as long as face, third segment gradually widened from base to truncate tip, nearly three times longer than second, latter sometimes obscurely reddish; arista rather short, micro pubescent, moderately thickened and blackish near base thence brownish to tip, middle segment barely longer than wide; face strongly receding in profile, its lateral ridges practically bare; vibrissae on oral margin; parafacial thinly silvery pollinose, slightly narrowed below and barely exceeding one-fourth clypeal width, bearing a median row of eight to ten stoutish infraclinate bristles; cheeks nearly one-half eye height, subshiny black below, grooves red, pruinose; proboscis short; palpi reddish yellow, moderately elongate and slender; eyes bare, rather small, the lower edge far above vibrissal level; back of head moderately convex, subshining black, with a sparse vestiture of pale hairs.

Thorax and scutellum shining black, notum at most faintly pruinose in a flat rear view. Chaetotaxy: acrostichal 2,2 ?; dorsocentral 2 or 3,3; intraalar 3; supraalar 3; presutural 2 (inner one small); humeral 3; postalar 2; sternopleural 3; scutellum with 2 lateral (hind pair large, divaricate), 1 good-sized decussate apical and 1 smaller preapical pair besides several erect irregular discals; prosternum, propleura and postnotal slopes bare.

Legs shining black, moderately stout; middle tibiae with two or three large and several smaller bristles on outer front side; hind tibiae with row of irregular bristles on outer posterior side; front tarsi normal; claws and pulvilli shorter than apical tarsal segment.

Wings brownish costally, paler or subhyaline on broad hind margin; first vein bare, third setulose almost to small cross vein; first posterior cell closed, petiole subequal to length of apical cross vein, reaching costa well before apex of wing; cubitulus subrectangular, without stump or fold; hind cross vein midway between cubitulus and small cross vein; last section of fifth vein two-fifths length of preceding; costal spine strong; calypters smallish, opaque white.

Abdomen narrower and considerably longer than thorax, wholly shining black; first segment without and second with a pair of erect median marginals and discals; third also with a pair of erect discals and a marginal row;

fourth bearing two rows of discals besides a row of weaker marginals; hypopygium rather small, retracted; sternites covered.

FEMALE. Similar to male but the third antennal segment smaller and about twice length of second; abdomen slightly broader, anal orifice caudoventral, genitalia retracted, without piercer; intermediate segments of front tarsi moderately swollen.

Length, 6.5-7.5 mm.

Holotype male and allotype female, Amherst, Ohio, July 14, 1934 (H. J. Reinhard) and June 19, 1939 (A. J. Barckert). Paratypes: 1 male, same data as type but collected July 5, 1930; 1 female, Waterton, Alberta, June 24, 1923 (H. L. Seamans) in the Canadian National Collection; 1 male, Cameron Pass, Colorado, July 5, 1931, without collector's label; 1 male and 1 female, L. Metigoshe, Turtle Mts., North Dakota, June 20, 1918, J. M. Aldrich collection.

Wagneria helyma (Walker)

Tachina helymus Walker, 1849, List Dipt. 4:795.

Scopolia sequax Williston, 1884, *In* Cook's Notes on Injurious Insects (Michigan), p. 5.

Phorichaeta sequax (Williston) Coquillett, 1897, Rev. Tachin., p. 127; Aldrich, 1905, Cat. N. A. Dipt., p. 475; Strickland, 1916, Ent. Branch, Dept. of Agric., Ottawa, Bull. 13, p. 22; Greene, 1921, Proc. U. S. Natl. Mus. 60:28; West, 1928, New York State List, p. 818.

Wagneria sequax (Williston) Baker, 1915, Ent. Soc. Ontario Ann. Rept. 45:86; Gibson, 1915, Ent. Branch, Dept. Agric., Ottawa, Bull. 9, p. 14; Curran, 1928, Can. Ent. 60:48; Schaffner and Griswold, 1934, U.S.D.A. Misc. Publ. No. 188, p. 124.

Wagneria helymus (Walker) Townsend, 1936, Manual of Myiology, pt. 4, p. 143.

The description of *Scopolia sequax* was based upon material reared from the black army cutworm in Michigan. Most subsequent determinations of *sequax*, so far as can be ascertained from descriptions, appear correct. But more recently Townsend expressed the opinion, "What has been called *sequax* is the true *helymus* Wlk. and belongs to *Wagneria*" (Manual of Myiology, 1936). Although none of the characters of the species was enumerated for comparison, it appears clear that *helymus sensu* Townsend is a form having the first vein bare. *Sequax* agrees in this respect. In reporting on the type specimen of *helymus*, Aldrich expressed the conclusion that the species is identical with *carbonaria*, without specifically mentioning the condition of the first vein (Proc. U.S. Natl. Mus., 80:14). However, in concurring with Stein's interpretation of *helymus* and according to specimens so labeled in the National Collection, Aldrich (for the latter reason Coquillett also) considered the species as having the first vein setulose.

These diverse diagnoses of the species have necessitated reexamination of the type specimen, which discloses that the first vein is bare; also, that other pertinent details agree closely with *sequax*, which therefore falls as a synonym of *helymus*, as first pointed out by Townsend.

The essential characters of the species may be gleaned from the items listed in the accompanying key. It is widespread in the United States and Canada ranging northward to Alaska. One specimen in my collection is labeled, "Reared from *Peridroma saucia*, Whittier, Cal., 5-20, 14" and two, "Reared from *Cirphis* sp., Tacoma, Wn., 7-19-36, J. Wilcox". Baker reared one speci-

men at Guelph, Ontario, from the armyworm *Cirphis unipuncta* (Haw.) and Strickland two specimens at Lethbridge, Alberta, from one host larva of *Euxoa auxiliaris* Grt. Schaffner and Griswold record the species reared from *Polia adjuncta* Bois., *Graptolitha* sp., *Conistra devia* Grt. and an unidentified noctuid. Rearing records of material in the U.S. National Museum also include *Lithophane innominata* Wlk. as a host of the species in Maine.

Wagneria cinerosa (Coquillett)

Phorichaeta cinerosa Coquillett, 1902, Proc. U. S. Natl. Mus. 25:116; Aldrich, 1905, Cat. N. A. Dipt., p. 475; Greene, 1921, Proc. U. S. Natl. Mus. 60:19; Snow, 1925, Jour. Econ. Ent. 18:609.
Wagneria cinerosa (Coquillett) Curran, 1928, Can. Ent. 60:48.
Polideosoma cinerosa (Coquillett) Townsend, 1940, *partim*, Manual of Myiology, pt. 10, p. 253.

The original description, based upon a single female specimen from Flagstaff, Arizona, is brief and omits many essential details. A more complete redescription of the female characters has been supplied by Townsend (*loc. cit.*) and the hitherto unknown male may be characterized in part as follows:

Front at vertex 0.34 of head width, slightly greater at antennal base; parafrontal, parafacial and cheek with rather dense gray pollen; frontal vitta much wider than parafrontal; outer verticals barely differentiated; ocellars small; one reclinate and two proclinate orbitals; parafacial rather narrow with sparse minute hairs outside main row of bristles; clypeus moderately depressed, gray pollinose; vibrissae near oral margin; antenna three-fourths facial length, black, third segment pale reddish or yellow on inner side at base, straight on anterior edge and three to four times longer than second; arista rather short, blackish, bare, thickened about to middle, proximal segments short; proboscis short, palpus slender, reddish yellow; cheek nearly one-half eye height; occiput thinly gray pollinose, sparsely pale-haired at middle below.

Thorax and scutellum shining black but showing thin whitish pollen in a flat rear view; acrostichal 2, 1; dorsocentral 2,3; presutural 1 (outer); sternopleural 2; intrapostalar hairlike; scutellum with 2 lateral, 1 decussate apical and 1 erect discal pair set well before middle of disk; postnotal slope, propleuron and prosternum bare. Legs black; mid tibia with two stoutish anterodorsal bristles; claws and pulvilli hardly equal to length of apical tarsal segment. Wing subhyaline, sometimes slightly brownish on anterior margin, costal spine strong; calypters white.

Abdomen long ovate, narrower than thorax, wholly polished black; intermediate segments with discals; one pair of median marginals on segments two and three; anal segment with numerous discals over most of upper surface; genitalia black, retracted. Length, 4-5 mm.

Coquillett's description of the female states ". . . . . third antennal segment at base yellow, ... sides of front, face and cheeks opaque, grayish pruinose, antennae three-fourths as long as face, the third joint blunt pointed at the apex, three times as long as second; . . . . .".

In the material examined, 14 males and 12 females, from Utah, Oregon and Washington, apparently belong here. All of these specimens have the

base of the third antennal segment yellow as mentioned in the description; the color is paler and usually more extensive in the female.

Snow reared the species at Vernal, Utah, from *Euxoa auxiliaris* Grt. The type specimen is in the U.S. National Museum.

Wagneria rohweri (Townsend)

Polideosoma rohweri Townsend, 1915, Jour. New York Ent. Soc. 23:226.
Polideosoma cinerosum Townsend (nec Coquillett), 1936, *partim*, Manual of Myiology, pt. 4, p. 143.

The history of the present species is brief. It was described (male only, from Colorado) as the type of *Polideosoma*. Subsequently Townsend (loc. cit.) expressed his belief that *P. rohweri* was the male of *Phoricheta cinerosa* Coquillett and in accordance with this conclusion cited the latter as the genotype of *Polideosoma*.

This association of sexes is in error. The male of *rohweri* has the third antennal segment greatly elongated, strongly concave on the front margin and the enlarged clypeus is deeply sunk. As here considered, the male of *cinerosa*, like the female, has quite ordinary antennae. The latter are about three-fourths as long as the face, with the front edge of the third segment straight in profile. Also, the clypeus is correspondingly smaller in size and much less depressed.

Material examined includes 5 males from Colorado (type locality), Idaho and Washington, of which three are labeled "ex *Agrotis orthogonia*, 1932". The female has not been identified; it may prove indistinguishable from *cinerosa*.

The holotype of *P. rohweri* is in the U. S. National Museum. I have not seen it and no other additional material has been recorded.

PRELIMINARY STUDIES ON CONTROL OF WHITE GRUBS IN WHEAT[1]

by

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White grubs proved to be an economic problem in fall sown wheat in Kansas in 1953. Although the major portion of the grub population consisted of *Cyclocephala* species, a few species of *Phyllophaga* also were present in some fields. Larval counts ranged from an average of 6 to 16 grubs per square foot in many fields. A maximum count of 37 larvae per square foot was obtained in a field near Lyons, Kansas. Larvae were more abundant in areas where heavy straw mulches were turned under. Injury by this insect necessitated considerable replanting of wheat.

MATERIALS AND METHODS

A series of insecticide test plots were set up at Lyons and Miltonvale, Kansas. Insecticides used in the tests included wettable powder formulations of dieldrin and heptachlor, and emulsifiable concentrates of aldrin, endrin, and heptachlor. All these materials were applied at the rate of 2 pounds of actual toxicant per acre.

At Lyons, Kansas, wettable powder insecticides were mixed with the grain and applied through the drill box while planting.

At Miltonvale, the insecticides were sprayed by broadcast method over the surface of the field by use of a boom type weed sprayer. These broadcast plots were further subdivided. Half were disked immediately after application and just preceding drilling while the remaining half were drilled shortly after spraying without disking. These broadcast applications were made 10 days later than those at Lyons, at which time the grubs had migrated too far down to be affected by the insecticides. As a result, all subsequent discussion refers to the plots at Lyons.

The number of larvae per square foot and stand counts were the criteria used to determine the effectiveness of the insecticides and the methods of application used.

RESULTS AND DISCUSSION

Because a 50 per cent dieldrin wettable powder and a 25 per cent heptachlor wettable powder were available for use, it was necessary to apply 4 and 8 pounds of formulated material, respectively, mixed with 1 bushel of wheat, in order to attain an application rate of 2 pounds of actual toxicant per acre. In order to test the possibility of layering out or settling out of these materials in the drill box, either in an upward or downward position, pint carton samples of grain from the drill box were taken at various levels in the box

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TABLE 1. Data regarding layering out of 50 per cent w.p. dieldrin and 25 per cent w.p. heptachlor when applied through a drill box at planting time at the rate of 2 pounds of actual toxicant per acre for control of white grubs in wheat on September 19, 1953, near Lyons, Kansas.

Insecticide	Sample No.	Top sample taken when grain box was	Weight of grain in grams per sample	Weight of sifted insecticide in grams per sample	Ratio of insecticide to grain (%)
Dieldrin	1	full	292.1	21.9	7
	2	¾ full	304.3	15.6	5
	3	½ full	299.1	20.0	6
	4	¼ full	292.2	30.5	10
Heptachlor	1	full	267.3	44.0	16
	2	¾ full	275.7	39.5	14
	3	½ full	266.5	37.5	14
	4	¼ full	301.2	39.5	13

during time of actual planting operations. These samples were brought to the laboratory and carefully sifted and weighed. Table 1 shows that there was generally an excellent distribution of heptachlor throughout the drill box as indicated by the rather uniform ratio of the insecticide to the grain throughout the box. The dieldrin was rather uniformly distributed in the first three samples but settling was evident in the fourth sample. It was observed that the heptachlor formulation had better sticking qualities than did dieldrin.

Larval counts (Table 2) were taken on September 28, 1953, from random samples in a 9-acre plot, each sample 1 square foot in size and 10 inches deep. Ten samples were taken from each of the heptachlor, dieldrin, and control plots one week after treatment. Data do not indicate a high level of control at this time. This may have resulted in part from the downward migration of the grubs to a depth of several inches along with decreased activity, particularly at soil levels near the surface, probably as the result of recent low atmospheric temperatures.

TABLE 2. Total number of larvae, and number and per cent of larvae dead in 30 square-foot soil samples taken from the white grub insecticide test plots near Lyons, Kansas, on September 28, 1953 (one week following application).

Plot	Total number of larvae	No. of larvae found dead	Per cent of larvae dead
Control	123	1	0.8
Dieldrin	88	9	10.2
Heptachlor	109	10	9.2

TABLE 3. Total number of wheat plants and per cent reduction in stand as indicated by data from 60 stand counts in the white grub insecticide test plots near Lyons, Kansas. Data were taken November 27, 1953, 69 days after treatment.

Plot	Number of plants alive	Per cent reduction in stand
Control	206	73
Dieldrin	742	0
Heptachlor	747	0

Warm weather and additional moisture followed a week or two later and apparently resulted in increased larval activity. On November 27, stand counts were made. There were striking visual differences between treated and untreated plots (Figure 1). Twenty stand count samples were taken in each plot with each sample consisting of 5 linear feet of row. This made a total of 100 feet of row per treatment in which stand counts were made. The stand count data are summarized in Table 3. In one sample, only 2.7 per cent as many plants occurred in the control as in the treated plots. There were no significant differences between stands in plots treated with heptachlor and dieldrin, but a 73 per cent reduction was found in the control plots. All samples were taken at random. However, it should be pointed out that, because of the peculiar habits of these larvae whereby they often work in spots or irregular areas, samples taken on the outside of margins of such areas tend to minimize the reduction figure. In stand count samples taken in heavily infested areas, stand reductions ranged from 91 to 97.3 per cent.

The untreated plots displayed not only a reduction in stand but a retardation of plant growth. Plants in treated plots ranged from 5 to 6 inches tall compared with 3½ to 4½ inches tall in the untreated plots. Stooling of plants was significantly greater in the treated areas.

SUMMARY

White grubs, particularly species of *Cyclocephala,* created an economic problem in wheat sown in the fall of 1953 in several Kansas counties. Larval counts averaged 6 to 16 grubs per square foot and ranged as high as 37 per square foot. Stand reductions were highly significant and resulted in replanting of considerable number of acres.

Plots established at Lyons, Kansas, showed marked visual differences between the treated and untreated plots. Heptachlor and dieldrin, applied through the drill box at the rate of 2 pounds of actual toxicant per acre gave effective control of white grubs in wheat where 73 per cent reduction in stand occurred in the adjacent control plots. There were no significant differences in stand between heptachlor and dieldrin.

The untreated plots displayed not only a loss in stand but a retardation of plant growth. Stooling of plants was significantly less in the untreated areas.

Continued studies to determine minimum insecticide applications and habits of the grubs are needed.

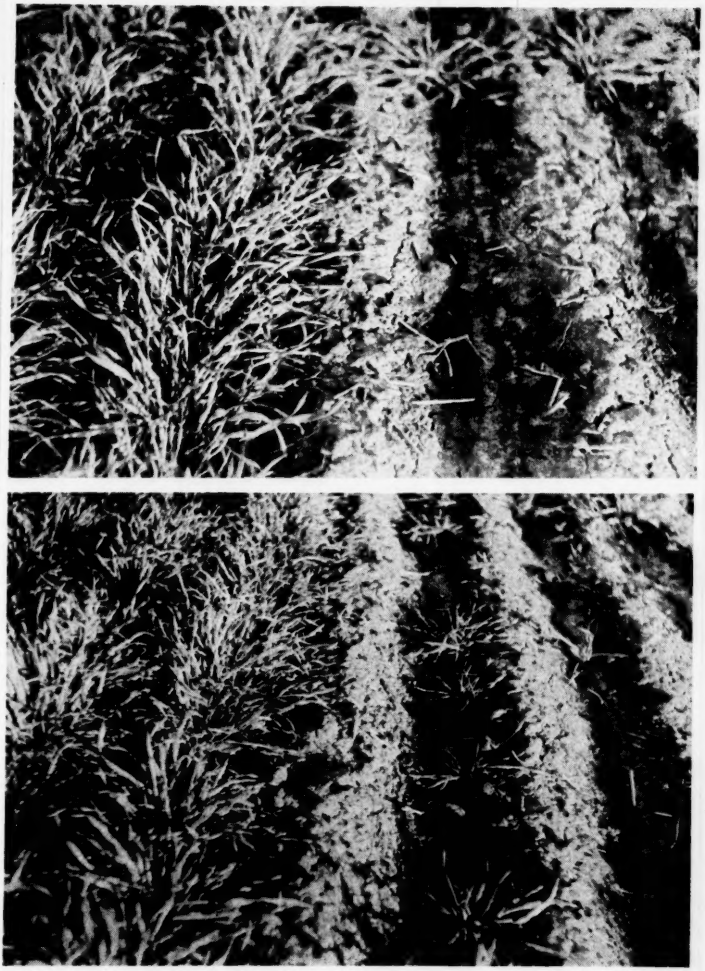

FIGURE 1.

Above: Stands in white grub test plots in wheat near Lyons, Kansas, on November 27, 1953. Left, heptachlor; right, control.

Below: Stands in white grub test plots in wheat near Lyons, Kansas, on November 27, 1953. Left, dieldrin; right, control.

SOME APHID AND HOST PLANT RECORDS FROM MISSOURI[1]

By

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During the summer of 1950 it was possible to collect a number of aphid species in Kansas City (Jackson County), Missouri. Inasmuch as the aphid fauna of Missouri is rather incompletely known, and because the faunas of Illinois, Kansas and Colorado have been studied rather extensively by Hottes and Frison (1931), Kring (1952) and Palmer (1953), the identifications with such host records as were obtained are given below. The nomenclature follows that of Palmer (1953). All specimens are in the collection of the author.

APHIDAE Samouelle

APHINAE Gillette and Palmer

1. *Cinara tujafilina (del Guercio)* in colonies on bark of aborvitae (*Thuja virginiana*), June 22, 1950. Börner (1952) places his species in the genus *Cupressobium* CB.
2. *Longistigma caryae* (Harris) in flight June 15, 1950. Hottes and Frison (1931) and Kring (1952) list this species from sycamore (*Platanus occidentalis*) and oak (*Quercus* sp.).
3. *Myzocallis bella* Walsh in flight June 16, 1950. The writer is grateful for the determination of this species by Drs. H. Bruce Boudreaux and A. N. Tissot. A second species collected in flight on August 12 and again on oak (*Quercus* sp.) on August 19 is, according to correspondence with Dr. Boudreaux, one of their unnamed new species in this group. Drs. Boudreaux and Tissot are revising this group of the genus *Myzocallis*.
4. *Myzocallis punctatella* (Fitch) in flight August 19, 1950. Hottes and Frison (1931) list this aphid from the leaves of oak (*Quercus* sp.) and hickory (*Carya* sp.). They placed the species in the genus *Tuberculatus* Mordvilko.
5. *Myzocallis ulmifolii* (Monell) on leaves of American elm (*Ulmus americana*) June 21, 1950; in flight July 10, 1950. Hottes and Frison (1931) also include this species in the genus *Tuberculatus* Mordvilko.
6. *Drepanaphis kanzensis* Smith on leaves of hard maple (*Acer* sp.) June 26, 1950.
7. *Chaitophorus viminalis* Monell on leaves of willow (*Salix* sp.) August 2, 1950.
8. *Periphyllus populicolus* (Thomas) on leaves of cottonweed (*Populus* sp.) June 24, 1950.

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[1]These collections were made while the author was an Instructor in Biology, Rockhurst College, Kansas City, Missouri.

[2]Assistant Entomologist.

9. *Pterocomma smithiae* (Monell) on bark of willow (*Salix* sp.) July 2, 1950.
10. *Aphis bakeri* Cowen in flight July 3, 1950; on leaves of red clover (*Trifolium pratense*) December 25, 1949. Börner (1952) places this species in the genus *Nearctaphis* Shap.
11. *Aphis cardui Linnaeus* on leaves and flower heads of thistle (*Cirsum* sp.) August 11, 1950. Börner (1952) places this species in the genus *Brachycaudus* van der Goot.
12. *Aphis fabae* Scopoli on leaves of burdock (*Arctium* sp.) July 26, 1950.
13. *Aphis folsomii* Davis on leaves and stems of Boston ivy (*Parthenocissus* sp.) July 10, 1950.
14. *Aphis illinoisensis* Shimer on leaves and terminals of grape (*Vitis* sp.) July 11, 1950.
15. *Aphis pilosicauda* Gillette and Palmer on leaves of thistle (*Cirsum* sp.) August 11, 1950.
16. *Aphis pseudohederae* Theobald on leaves and stems of ivy (*Hedera helix*) June 16, July 16, 1950. Börner (1952) lists this species as a synonym of *Aphis hederae* Kalt.
17. *Aphis sambucifoliae* Fitch on leaves of elder (*Sambucus* sp.) July 18, 1950.
18. *Aphis setariae* (Thomas) on leaves of blue grass (*Poa* sp.) July 18, 1950. Börner (1952) and a number of others place this species as the type of the genus *Hysteroneura* Davis.
19. *Aphis spiraecola* Patch on leaves and terminals of *Spiraea* sp. July 26, 1950.
20. *Rhopalosiphum fitchii* (Sanderson) on Sudan grass (*Sorghum* sp.) July 18, 1950.
21. *Rhopalosiphum maidis* (Fitch) in flight August 17, 1950. This species is normally found in colonies on corn and other grasses.
22. *Rhopalosiphum rhois* Monell in flight July 10, 1950. This species is found on sumac (*Rhus* sp.). Palmer (1953) indicates a migration to certain grasses as secondary hosts.
23. *Amphorophora sensoriata* Mason on canes of raspberry (*Rubus* sp.) August 10, 1950.
24. *Capitophorus wasatchii* Knowlton in flight July 30, 1950. Palmer (1953) records this species from *Artemisia* sp., *Chrysothamnus* spp., *Gaertneria* sp., and *Liatris* sp.
25. *Macrosiphum ambrosiae* (Thomas) on leaves of ragweed (*Ambrosia trifida*) July 26, 1950.
26. *Macrosiphum erigeronensis* (Thomas) on stems and leaves of daisy fleabane (*Erigeron annuus*) July 26, 1950.
27. *Macrosiphum illini* Hottes and Frison in flight and on ground cherry (*Physalis* sp.) July 10, 1950. Hottes and Frison (1931) gave wild sunflower (*Helianthus* sp.) as the host of this aphid.
28. *Macrosiphum rosae* (Linnaeus) on leaves and stems of roses (*Rosa* sp.) June 25, 1950.

29. *Macrosiphum sanborni* Gillette on leaves and stems of *Chrysanthemum* sp. July 17, 1950; in flight August 10, 1950.
30. *Macrosiphum solanifolii* (Ashmead) on stems and leaves of tomato (*Lycopersicon esculentum*) August 18, 1950; on stems and leaves daisy fleabane (*Erigeron annuus*) July 26, 1950; on leaves of green pepper (*Capsicum* sp.) June 25, 1950; on leaves of rhubarb (*Rheum officinale*) August 18, 1950.

ERIOSOMATINAE Kirkaldy

31. *Eriosoma lanigerum* (Hausmann) in pseudo galls on American elm (*Ulmus americana*) June 15, 1950.
32. *Pemphigus nortonii* Maxson in flight July 3, 1950. Palmer (1953) records this species from cottonwood (*Populus sargenti*).
33. *Pemphigus populi-caulis* Fitch in twisted petiole and leaf galls on cottonwood (*Populus sargenti*) June 20, 1950.
34. *Pemphigus populi-transversus* Riley in petiole galls on cottonwood (*Populus sargenti*) July 13, 1950.

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BOOK NOTICE

Insect Fact and Folklore by Lucy W. Clausen, The Macmillan Co., New York, 1954. 194 pp.

The professional entomologist, of course, will be more interested in the folklore than in the facts in this entertaining little book. Dr. Clausen, from her background in public instruction at the American Museum of Natural History and from an extensive bibliography of entomological and anthropological papers, gives us both ancient and recent beliefs and practices concerning insects. We learn of living elaterids worn as jewels in the West Indies, of cockroaches steeped in fiery liquor as a treatment for flu in Peru, the ordeal by ants at puberty among the Arawaks of Guiana, the use of bedbugs crushed in salt and human milk as an eye ointment, the eggs of water boatmen sold as caviar.

This is a fine book to recommend to the layman and a boon to the instructor in entomology who would enliven his lectures.

Mary H. Michener

A NEW *LIMNOMETRA* FROM SUMATRA (Gerridae)[1]

By

H. B. HUNGERFORD

Dr. O. Lundblad, 1933, lists for the Indoaustralian-Pacific region eighteen species of *Limnometra* including one he described as new.

In the Kirkaldy collection that came to the University of Kansas some years ago, I find a characteristically marked species that is undescribed.

Limnometra octopunctatus n. sp.

Size: Apterous male: 9.24 mm. long; width across the mesoacetabula, 2.625 mm. Apterous female: 11.25 mm. long; width across the mesoacetabula, 3.25 mm.

Color: Reddish brown above, lighter beneath; the head with a broad median brown band that is wider in front and bordered by lighter narrower lines; the pronotum with a median black band that is broad in front and tapering on the anterior lobe to a slender line that continues on the posterior lobe to its apex; the posterior lobe with a slender lateral submarginal black line to the shoulders where it broadens and is bordered by a pale line around the apical lobe; behind the pronotum is a median brown to black band that continues to abdominal tip; on this dark band from the third abdominal segment to the eighth there is a median series of gray streaks; on each acetabulum, a pair of black spots; between these spots a small creamy white spot on the mesoacetablum and on the metaacetabulum a large triangular creamy white spot. On the venter eight large nearly round black spots that characterize the species and suggest the name. These spots are located as follows: One black spot in front of and one on the venter beneath each mesoacetabulum, one beneath each metaacetabulum and another on either side of the last abdominal segment. On each side of the first genital segment of the male there is another black spot half hidden beneath the last abdominal segment. If such spots are also on the female they are entirely hidden.

Structural Characteristics: The male has lost the last two segments of its antennae. The length of the first and second segments are respectively 2.6 mm. and 2.73 mm. so the second is longer than the first. The female also is imperfect and only one antenna is represented by three segments that measure: 1st, 2.52 mm.; 2nd, 2.14 mm., 3rd, 2.18 mm. The beak is moderately long (3.21 mm.), the elongate third segment reaching back some distance on the mesosternum. The relative lengths of the segments of the beak are 1st: 2nd: 3rd: 4th:: 30: 13: 90: 21 (♂). The fourth segment black and shining and its mean diameter about half that of the third which is slender and its diameter about half that of the first segment. The front legs of both sexes have the basal two-thirds of the femora thickened. The relative lengths of the segments, femur: tibia: 1st tarsal; 2nd tarsal:: 167: 137: 23: 23 (♂) and 180: 155: 30: 30 (♀). The middle legs long, the femur being 9.24 mm. long in the male and 10.3

[1]Contribution No. 879 from the Department of Entomology, University of Kansas.

mm. in the female; the relative lengths of the segments, femur: tibia: tarsus:: 440: 410: 120(♂) and 490: 466: ?(♀); the hind legs shorter than middle legs; the hind femur of the male 9.24 mm. long and that of female 10.25 mm.; the relative lengths of the male segments being, femur: tibia: tarsus:: 440: 217:?; for the female 488: 290: 70. In the male the connexival spines reaching about three-fourths the length of the first genital and in the female surpassing the first genital and extending half the length of the last genital. Ventrally the rear margin of the first genital segment of the male has laterally on each side a projection.[2]

Location of Types: Described from holotype male and allotype female and one male partype bearing the label "Dr. B. Hagen, Tandjong Morawa. Serdang. (N.O. Sumatra)" These are in the Francis Huntington Snow Museum, University of Kansas.

Comparative Notes: The eight distinct black spots on the venter will identify this species. The lateral angular projections on the rear margin of the first genital segment of the male appear to relate it to *L. ciliatus,* Mayr. It also has the ciliate row on the rear margin of the middle femur but not as conspicuous as in *L. ciliatus* and is a smaller species.

Discussion: There is need for a critical study of the genera of Gerridae. As the literature stands at present it was necessary to scan the descriptions of species described under the genera *Gerris, Limnoporus, Limnometra, Tenagogonus, Limnogonus,* etc. to determine that the above is a new species. It still seems strange to me that so striking a species should remain undescribed. Dr. O. Lundblad, 1933, in his "Zur Kenntnis der aquatilen und semiaquatilen Hemipteren von Sumatra, Java und Bali" examined many types of Gerridae and *Tenagogonus* and lists for the Indoaustralian-pacific region fourteen species of *Gerris,* eleven species of *Limnogonus* and eighteen species of *Limnometra.* While Dr. Lundbad is correct in stating that the genotype of *Tenagogonus,* Stal, 1853 (*T. albovittatus* Stal, 1855, from Africa) is quite different from the genotype of *Limnometra* Mayr, 1865 (*L. femorata* Mayr, 1865, from the Philippines) it is also true that *T. albovittatus* (Stål) is just as different from most other species that have been assigned to *Tenagogonus.* All the species I have examined, whether under *Limnometra* or *Tenagogonus* have the same general facies. The middle and hind femora long, nearly as long as the body, or longer, the antennae long and slender, the front tarsal segments about equal in length and the beaks of all of them extend for some distance on the mesosternum. The only species that I have seen that may be related to *Tenagogonus albovittatus* Stål are an undetermined one in our collection from Sumatra, *T. madagascarensis* Hoberlands, *T. dubius* Poisson and *T. kompaspe* (Kirkaldy).

[2] *L ciliatus* Mayr has this character also.

SPIROBOLIDAE (SPIROBOLIDA: DIPLOPODA) EAST OF THE ROCKY MOUNTAINS

by

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Two families of the predominately tropical and subtropical milliped order Spirobolida have numerous representatives in the United States. Of these, the Atopethalidae (Chamberlin 1918, 1948) occur in the southern parts of only the states bordering Mexico, while the Spirobolidae (Cook 1904, Chamberlin 1949) are found in almost all the states. A third family, the Rhinocricidae, occurs sparsely in California and on Vancouver Island (Chamberlin 1947, 1951).

The genera of the family Spirobolidae east of the Rocky Mountains are *Narceus, Chicobolus,* and *Californibolus.* These big millipeds are collectively the *"Spirobolus marginatus"* of many amateur and, unfortunately, also of some professional biologists. Until recently the genus *Narceus* has been known either as *Spirobolus* or as *Arctobolus* in this country. In a very fine piece of work Hoffman and Crabill (1953) pointed out that the use of *Spirobolus* must be restricted to certain Oriental species, and that our genus must bear the senior synonym. *Narceus. Narceus* seems to be limited to species occurring from New York south into Florida and westward through southern Ontario and the eastern United States into Nebraska, Kansas, Oklahoma, and Texas. *Chicobolus* is known from South Carolina, Georgia, Florida, and the Florida Keys. *Californibolus* is unusual in that it occurs on both sides of the Rocky Mountains, with species in California, Oregon, Kansas, Nebraska, and Iowa.

Mature specimens of the species considered here usually have between 45 and 58 body segments, with the last one, sometimes last two, legless. The width may be from 4 up to 10 or 11 mm., with the female usually larger than the male. The number of setigerous labral foveolae is between 3 + 3 and 8 + 8; this character is of doubtful value in making determinations. Neither is color a reliable diagnostic criterion, because it varies with the maturity of the animal and the method and length of preservation. In males of the last larval stadium, the gonopods and coxal lobes are incompletely developed, but they resemble the fully developed structures enough to be of some value in making determinations.

Key to Genera Based on Adult Males

1 (4) Posterior gonopods with a free inner movable piece; apex of last article of posterior gonopods blunt. Last article of anterior gonopods bluntly uncinate. One or more pairs of third through sixth legs produced ventrad in lobes that are acute at the apex. Coxae of third legs modified, but never as blunt, uncinate lobes 2

2 (3) Medial projection of sternum of anterior gonopods about as long as wide, with the apex broad. Last article of posterior gonopods without

a subapical spur. Coxae of seventh legs never or but slightly produced ventrad, but coxae of third legs are always produced ..... *Narceus*

3 (2) Medial projection of sternum of anterior gonopods longer than wide, with the apex very narrow to acute. Last article of posterior gonopods with a small subapical spur. Coxae of seventh legs the largest; coxae of third legs slightly produced ventrad ..... *Chicobolus*

4 (1) Posterior gonopods without a free inner piece. Apex of last article of posterior gonopods acute. Last article of anterior gonopods blunt, but not uncinate. None of coxal lobes of third through sixth legs acute at apex. Coxal lobes of third legs modified as short, blunt, uncinate lobes ..... *Californibolus*

Key to Genera Based on Somatic Characters

1 (4) Caudal tergite with a slight horizontal depression. Ratio of length of exposed parts of caudal tergite and anal valves, as viewed from above, 5/1 or 4/1 2

2 (3) Mandibular cheek with a shallow antennal furrow. Anterio-ventral margin of mandibular cheek with a triangular lobe (Fig. 1a). Exoskeleton coarsely punctuate ..... *Narceus*

3 (2) Mandibular cheek almost flat, without an antennal furrow. Anterio-ventral margin of mandibular cheek rounded (Fig. 1b). Exoskeleton coriaceous and finely punctuate ..... *Chicobolus*

4 (1) Caudal tergite without any trace of a horizontal depression. Ratio of length of exposed parts of caudal tergite and anal valves, as viewed from above, about 3/2. Mandibular cheek with a shallow antennal furrow. Anterio-ventral margin of mandibular cheek forms a sharp angle of about 90 degrees (Fig. 1c). Exoskeleton very slightly coriaceous but not punctuate ..... *Californibolus*

Narceus Rafinesque

Narceus Rafinesque, 1820, Annals of Nature, p. 8; Hoffman and Crabill, 1953, Florida Ent. 36(2):80-81.
Rhenexor Rafinesque, 1820, Annals of Nature, p. 8.
Spirobolus Brandt, 1833, Recueil, p. 114; Chamberlin, 1947, Proc. Acad. Nat. Sci. Philadelphia 99:44-46.
Arctobolus Cook, 1904, Harriman Alaska Exped. 8:65.

Generotype: *Narceus tinctorius* Rafinesque.

Species of *Narceus* are difficult to determine because the gonopods appear to be almost identical throughout the genus. Variations in body size and color are not well enough understood to be of much value. In alcoholic specimens the hindbelts are usually red-brown, the midbelts are gray-brown, and the legs are rose-red; often there are orange bands on the margin of the collum, the hindbelts, and the anal valves. Green seems to be present only in recently molted specimens. The coxal lobes of the third through the seventh legs of the male seem to be the most dependable criteria on which to make specific determinations, but they must be used cautiously, for they vary as to their turgidity, length, curvature, size of the apical angle, and color. Sometimes their appearance is so confusing I have felt that thorough collecting may

show that the genus, as presented here, is composed of only two polytypic species.

Key to the Species of *Narceus* Based on Males[1]

1 (2) Third coxal lobe (Fig. 3) wedge-shaped, usually flattened, without a horizontal furrow or fold across the cephalic surface. Seventh coxa slightly produced, apex never acute ..... *marginatus* (Say)

2 (1) Third coxal lobe (Fig. 2 a) with a horizontal furrow or fold across the middle of the cephalic surface; distended laterad, turgid. Seventh coxa with apex either rounded or acute 3

3 (4, 5) Sixth coxal lobe acute and flattened; seventh rounded ..... *tinctorius* Rafinesque

4 (3, 5) Sixth and seventh coxal lobes acute ..... *orophilus* (Chamberlin)

5 (4, 3) Sixth and seventh coxae never with acute lobes ..... *oklahomae* (Chamberlin)

Narceus tinctorius Rafinesque

Figures 2a-2e

Narceus tinctorius Rafinesque, 1820, Annals of Nature, p. 8 ("Woods of Kentucky"). Hoffman and Crabill, 1953, Florida Ent. 36(2):80.

Julus atratus Girard, 1853, Rept. Marcy's Red River Exped., p. 245 (Prairie Mer Rouge, Morehouse Par., Louisiana).

Spirobolus [?] *agilis* Cope, 1869, Proc. Amer. Philos. Soc. 11(81):181 (Giles Co., Virginia).

Spirobolus marginatus (Say). [*partim*] Wood, 1865, Trans. Amer. Philos. Soc. 13:207-209; [*partim*] Bollman, 1893, Myr. N. Amer., pp, 48, 73, 95, 145.

Spirobolus woodi Humbert and Saussure, 1870, Rev. et Mag. Zool. (2)22:177 ("America borealis, Saint-Louis").

Arctobolus dolleyi Loomis, 1943, Bull. Mus. Comp. Zool. 92(7):398-400, fig. 13 (Lee Co., Mississippi).

Narceus americanus (Beauvois). Chamberlin, 1953, Amer. Midland Nat. 50(1):150.

Restricted type locality: Natural Bridge, Powell County, Kentucky.

Distribution: From the mountains of Virginia and North Carolina (Hoffman 1951), south to Jackson County, Mississippi; west to Brazoria County, Texas; north throughout Louisiana, Mississippi, Arkansas; Stone, St. Louis, and Jefferson Counties, Missouri; Green and Johnson Counties, Illinois; Grant County, Wisconsin; Montgomery County, Indiana; Ashland County, Ohio; Warren and Powell Counties, Kentucky.

Adults of this species measure from 5 to 10 mm. in width, with the larger sizes most common. In the male the third coxal lobes are acute, but also conspicuously turgid and distended laterad, and there is a horizontal furrow across the cephalic surface, as shown in figure 2a. The fourth, fifth, and sixth coxal lobes are wedge-shaped, flattened, sometimes curled forward, and sometimes turgid. The fourth are as long as or longer than the third, but the fifth and usually the sixth are shorter. The seventh are still shorter and the apex is rounded. All of these lobes are contiguous with their mates along the mesial margin in mature specimens, but in juvenile males they turn laterad about five degrees.

[1] Texas and Florida species have been omitted, but bibliographic references to them are given at the end of the section on *Narceus*.

Figure 2 was drawn from a male from the restricted type locality. Figures of the coxal lobes and the gonopods were published by Loomis (1943).

Narceus americanus Palisot, *nomen inquirendum*

Julus americanus Palisot de Beauvois, 1805, Ins. Rec. Afrique et Amerique, pl. 4, Apteres, figs. 3a-c; *J. americanus borealis, ibid.* p. 155 ("Etatus-Unis d'Amerique").
Spirobolus americae-borealis (Beauvois). Bollman, 1893, Myr. N. Amer., pp. 145-146 ("Eastern North America exclusive of Georgia and Florida").
Spirobolus americanus (Beauvois). Hoffman, 1951, Florida Ent. 34(1):15-16.
Narceus americanus (Beauvois). Hoffman and Crabill, 1953, *ibid.* 36(2):80; Chamberlin, 1953, Amer. Midland Nat. 50(1):150.

The milliped that Palisot named *Julus americae borealis* or *J. americanus* was certainly a spirobolid, either of the genus *Narceus* or of *Chicobolus,* but specific determination is impossible. His figures show the body color as alternating orange and black bands. The entire description is as follows:

"Jule de l' amerique septentrionale. Cendré. Quarante-neuf segmens à l' abdomen. . . Cincereus.

"*Julus americanus borealis.* Cincerus. Abdomine segmentis 49."

Palisot travelled and collected from Philadelphia as far south as Georgia. Some of his arthopod specimens also came from Canada. At least two spirobolids occur in these areas; since it is impossible to determine which one Palisot described, his name must be regarded as a *nomen inquirendum.*

In a posthumous publication, Bollman (1893) changed his earlier determination of the spirobolid population of the eastern states exclusive of Georgia and Florida from *Spirobolus marginatus* (Say) to *S. americae-borealis* (Beauvois). This was ignored by more mature workers, who continued to designate the eastern population as *S. marginatus,* and Philadelphia was more or less accepted as the type locality. Recently Hoffman (1951), with no more evidence than that outlined above, stated that he is "inclined to arbitrarily adopt the name *americanus* for the animal heretofore known as *Spirobolus marginatus*". The descriptions of both Palisot and Say are inadequate and unworkable, perhaps equally so. There is some justification for the use of each name, however; *americanus* has priority, while *marginatus* has become well established. But to substitute one uncertain name for another uncertain name at this point would add nothing to our knowledge of the species, and it would certainly create confusion.

Recently Chamberlin (1953) has applied the name *N. americanus* to *N. tinctorius.* This is even more unsound than Hoffman's proposal to substitute it for *marginatus.*

Narceus marginatus (Say)

Figures 1a, 3

Julus marginatus Say, 1821, Jour. Acad. Nat. Sci. Philadelphia 2:105 (United States).
Spirobolus marginatus (Say). [*partim*] Wood, 1865, Trans. American Philos. Soc. 13:207-208, fig. 38, *not* fig. 35; Chamberlin, 1947, Proc. Acad. Nat. Sci. Philadelphia 99:44-46.
Spirobolus americae-borealis (Beauvois). [*partim*] Bollman, 1893, Myr. N. Amer., pp. 145-146.
Arctobolus marginatus (Say). [*partim*] Cook, 1904, Harriman Alaska Exped. 8:65; Loomis, 1943, Bull. Mus. Comp. Zool. 97(7):397-398, fig. 12.
Spirobolus americanus (Beauvois). Hoffman, 1951, Florida Ent. 34(1):15-16.
Narceus americanus (Beauvois). Hoffman and Crabill, 1953, *ibid.* 36(2):80.

Restricted type locality: Philadelphia, Pennsylvania.

Distribution: Coast and piedmont from North Carolina to New York, west into Grant County, Wisconsin; Cook, Jasper, and Will Counties, Illinois; Wolfe County, Kentucky; Richardson County, Nebraska. Chamberlin (1947) reported it from as far south as Florida. Records from Louisiana are based on an erroneous determination by Wood (1895). The name *marginatus* was applied to the entire *Narceus* population until the value of the coxal processes as diagnostic criteria was appreciated, so all older records must be questioned.

Adults measure from 4.6 to 10 mm. in width, with 6 or 7 mm. most common. Alcoholic specimens tend to be a little darker than in *tinctorius*. In the male the coxal lobes of legs three through six are wedge-shaped, usually flattened, but occasionally turgid, the apices acute and sometimes curled forward. The fourth is usually a little longer than the third, and the fifth and sixth are shorter. The seventh coxae are slightly produced in specimens from near Philadelphia as rounded or squared, but never as acute lobes. A cephalic view of a third coxal lobe of a specimen from Morris County, New Jersey, is shown in figure 3. This lobe is sometimes slightly inflated laterad, but never conspicuously so, nor is there ever a horizontal furrow on its cephalic surface, as in *tinctorius*.

Say's complete description of *Julus marginatus* is as follows:

"Body cylindric glabrous, blackish, segments with a rufous margin; ultimate segment unarmed.

"My Cabinet.

"*Body* cylindric glabrous, polished, blackish, beneath pale reddish; *segments* margined behind with rufous, anterior segment as long as the three succeeding ones conjunctly and entirely margined with rufous, second segment slightly, and obtusely angulated at the lateral tip of the anterior one; ultimate segment as long as the two preceding ones united, narrowed to the tip, which is rounded; *head* with an impressed line which is obsolete on the front; *labrum* pale, deeply and widely emarginate at the tip, with a submarginal, infracted series of ten or twelve punctures furnishing hairs, tip ciliated, reddish, obsoletely dentate.

"Length more than three inches.

"A very large species inhabiting decaying wood, &c. When irritated it diffuses an odor like that of muriatic acid, and is infested by *Gamasus Juloides*. It varies in color; the margins of the segments and all beneath are sometimes white, the ultimate segment is sometimes almost acutely angled at tip, and there is a distinct lateral series of black dots."

Say collected between Philadelphia and Florida. He mentioned the localities for some of his species, but not for others, among them *J. marginatus*. It has been assumed that those species for which Say designated no localities were described from specimens from the Philadelphia area.

Wood, who also worked in Philadelphia, may have used specimens from there for his description and figures of *marginatus*. Unfortunately he (1865) confused his figures, but not his text description, of *Spirobolus marginatus* and *S. spinigerus*, but one who is very familiar with both species can easily

detect the error. His figure 38, and not figure 35, is of the gonopods of *marginatus*, while figures 35 and 39 are of *spinigerus*.

It may have been Wood's error that led to Bollman's (1893) designation of *marginatus* as a senior synonym of *spinigerus* in a posthumous publication. Bollman's idea is so completely without any factual basis that it has been completely ignored by more experienced taxonomists, with the exception of Pocock (1893). Hoffman (1951) has sought to revive it, but it cannot be accepted because (1) Bollman based it upon the belief, for which there is no evidence now available, that Say's specimens came from Florida or southern Georgia; and (2) thus implied that only one spirobolid species occurs within that area; (3) he erred also in thinking that Say meant "lack of puncta" by "glabrous," whereas Say obviously meant "having a surface without projections," thus distinguishing *marginatus* from *Cambala annulata* and *Spirostrephon lactarium*, which he described in the same paper.

Narceus annularis (Rafinesque)

Rhenenor annularis Rafinesque, 1820, Annals of Nature, p. 8.
Arctobolus onondaga Cook, 1904, Harriman Alaska, Exped. 8:65.
Narceus annularis (Rafinesque). Hoffman and Crabill, 1953, Florida Ent. 36(2):81; Chamberlin, 1953, Amer. Midland Nat. 50(1):151.

Type locality: "Highland hills of New York."

Distribution: New York.

This is a questionable species, but Cook was such a thorough worker it seems unwise to abandon it until more thorough collecting has been done in New York. All recent determinations from there have been *N. marginatus*. Rafinesque's description can be found in Hoffman and Crabill's paper. Cook's description is as follows:

> "The type, collected at Kirkville, Onondaga County, New York, in June, 1895, is 65 mm. long by 5.3 mm. broad, with 55 segments. Color very dark, dull green, the posterior margins of the segments banded with dull red; legs uniform deep red. The first two pairs of legs are strongly crassate in the male and the coxae of pairs 3 to 7 are produced ventrad, but lack the larger hooked processes found in *Tylobolus*. The present species is abundant in favorable locations in central New York. It differs from the more southern *Arctobolus marginatus* (Say) in the smaller size, more slender body, more uniform dark color, and in the more distinct punctation of the surface of the segments. The basal joint of the gonopod is sinuate or emarginate laterad, instead of evenly convex as in *A. marginatus*."

Narceus oklahomae (Chamberlin)

Spirobolus oklahomae Chamberlin, 1931, Ent. News 42:98-99, pl. 2, fig. 1.

Type locality: Murray County, Oklahoma.

Type material: Private collection of Dr. R. V. Chamberlin, University of Utah.

Distribution: Hughes, Murray, Pittsburg, Pushmataha Counties, Oklahoma; Douglas County, Kansas; Monroe County, Iowa.

This is a slightly smaller and darker species than *N. tinctorius*. It can be distinguished from that and other species in which the third coxal lobes are

inflated laterad and bear a furrow on the cephalic surface by the absence of acute coxal lobes on the sixth and seventh legs. In Oklahoma specimens the sixth and seventh coxae are about as short and blunt as the coxae behind the gonopods, but in specimens from Kansas and Iowa they are almost as long as in *tinctorius*. There are specimens from northern Illinois and southern Wisconsin, reported here as *tinctorius*, clearly on the borderline between *tinctorius* and *oklahomae*.

Narceus orophilus (Chamberlin)

Spirobolus orophilus Chamberlin, 1943, Bull. Univ. Utah, Biol. Ser. 8(2):8-9, figs. 17-21.

Narceus orophilus (Chamberlin). Chamberlin, 1953, Amer. Midland Nat. 50(1):150.

Type locality: Gatlinburg, Great Smoky Mt. Natl. Park, Tennessee.

Type material: Chicago Natural History Museum.

Distribution: Sevier County, Tennessee; Harlan and Johnson Counties, Kentucky.

This is a larger and lighter species than *N. tinctorius*. It can be distinguished from others in the *tinctorius* group by the coxae of the seventh legs, which are produced as short, conical, acute lobes. The lobes of the sixth coxae are acute and flattened.

The following species from Texas and Florida are still known only from the original descriptions:

Narceus pensacolae (Bollman), 1887, Ann. New York Acad. Sci. 4:29; 1887, Ent. Amer. 1:28 (1893, Myr. N. Amer., pp. 49, 65) (Pensacola, Escambia County, Florida).

Narceus scotti (Chamberlin), 1943, Proc. Biol. Soc. Washington 56:148, figs. 12-14 (Harris County, Texas).

Narceus melanoir (Chamberlin), 1943, Bull. Univ. Utah, Biol. Ser. 8(2):9 (Stephen F. Austin State Park, Scaley, Austin County, Texas).

Narceus gordanus (Chamberlin), 1943, *ibid.* 8(2):5-7, figs. 6-11 (Punta Gorda, Charlotte County, Florida).

Narceus ramstadti (Chamberlin), 1943, *ibid.* 8(2):7-8, figs. 12-16 (Punta Gorda, Charlotte County, Florida).

Narceus keysi (Loomis), 1944, Psyche 51(3-4):169-170, fig. 2 (Lantana, Palm Beach County, Florida).

Chicobolus Chamberlin

Chicobolus Chamberlin, 1947, Proc. Acad. Nat. Sci. Philadelphia 9:46.

This genus differs from *Narceus* in that the ocelli are flat rather than slightly convex, the antennae are longer, reaching a little behind the caudal margin of the collum, the keels of the collum are narrower, the keels of the second segment are shorter, and the suture between the mid- and hindbelts is complete over the dorsum. Other characters are given in the key. Since the type species is still known only by a female, this definition of the genus and the inclusion of two other species in it must be regarded as tentative.

Generotype: *Chicobolus pilsbryi* Chamberlin.

Key to Species of *Chicobolus*

1 (2) Body solid black or bluish black, except for a ring of obscure chestnut

color on the caudal margin of the tergites; legs yellow ..... *C. pilsbryi* Chamberlin

2 (1) Body black or greenish black, this color broken at the sides but not on the dorsum by conspicuous vertical bands on the caudal margin of the tergites; legs red 3

3 (4) Vertical bands light green, of almost the same width their entire length. Coxal processes of fourth and fifth legs of the male each with the apical region rounded, flattened, and bent sharply caudad; coxal processes of seventh legs shorter than those of the fifth legs. Ventral margin of coxae of anterior gonopods undulate ..... *C. jucundus*, new species

4 (3) Vertical bands orange or brown, narrow above pores but widening below to completely cover the venter. Coxal processes of fourth and fifth legs of the male each with the apical region narrowed and never bent sharply caudad; coxal processes of seventh legs longer than those of the fifth. Ventral margin of coxae of anterior gonopods straight ..... *C. spinigerus* (Wood)

Chicobolus pilsbryi Chamberlin

Chicobolus pilsbryi Chamberlin, 1947, Proc. Acad. Nat. Sci. Philadelphia 99:46-47, figs. 46, 47.

Type locality: Boca Chica Key, Monroe County, Florida.
Type material: Academy of Natural Sciences of Philadelphia.
Distribution: Boca Chica Key, Monroe County, Florida.

Chicobolus spinigerus (Wood)

Figure 1b

Spirobolus spinigerus Wood, 1864, Proc. Acad. Nat. Sci. Philadelphia 16:15 (Florida, South Carolina); 1865, Trans. Amer. Philos. Soc. 13:211, figs. 35, 39, *not* fig. 38; Bollman, 1893, Myr. N. Amer. pp. 51, 95.
Spirobolus marginatus (Say). Bollman, 1893, Myr. N. Amer. pp. 145-146; Hoffman, 1951, Florida Ent. 34(1):15-16.
Spirobolus palustris Chamberlin, 1918, Ann. Ent. Soc. Amer. 11:374-375 (Mixon's Hammock, Okefenokee Swamp, Georgia).
Arctobolus spinigerus (Wood). Loomis, 1943, Bull. Mus. Comp. Zool. 92(7):398.
Narceus spinigerus (Wood). Chamberlin, 1953, Amer. Midland Nat. 50(1):151.

Restricted type locality: Everglades National Park, Florida.
Type material: Academy of Natural Sciences of Philadelphia.
Distribution: Key West, Florida, North to South Carolina (Loomis, 1943) and west to Tallahassee, Leon Co., Florida.

The following description is based on specimens collected in the Everglades National Park. *Width* 4 to 9 mm.; 45 to 52 *segments*, 1 legless. *Setigerous labral foveolae* 5 + 5 or 6 + 6. *Ocelli* in 6 or 7 rows, with from 10 to 1 or 2 ocelli in the rows. *Surface* of exoskeleton finely punctuate, except the caudal half of the hindbelts, which are almost free of puncta. Suture between mid- and hindbelts continued across dorsum. Apex of *caudal tergite* thin, the caudal one-third slightly depressed; ratio of caudal tergite to anal valves, as viewed from above, about 5:1. *Coxae* of legs 5, 6, and 7 of the male conspicuously produced, with each process closely appressed to its mate along

the medial line. The seventh coxal processes, which are the largest, are inflated and distended laterad and ventrad much as in the third coxal processes of *Narceus tinctorius,* but the apex is rounded instead of acute. The sixth coxal processes are narrower, with the apex flattened and curved caudad so as to rest on the ventro-cephalic surface of the seventh coxal processes. The fifth coxal processes are narrower and longer than the sixth, and the flattened apex of each is bent caudad so as to rest on the sixth. The fourth coxal processes are flattened, less than half as long as the fifth, and the apex is acute. The coxae of the third legs are but slightly produced, and the apex is rounded. The essential details of the *gonopods* are given in the keys. In museum specimens the position of the gonopods is much more variable than in species of *Narceus;* they vary between being conspicuously protruded to being deeply withdrawn and directed caudad.

Wood's confusion of the gonopods of *marginatus* and *spinigerus* was discussed in the section on *marginatus.*

Wood's (1864, 1865) description of the coxal processes also gives some trouble. If the reader is aware that Wood referred to the opening through which the gonopods protrude as the genital aperture, then his account of the coxal processes conforms with the description given above. In the following paragraph from Wood's description, the necessary corrections have been inserted:

"The three pairs of feet immediately in front of the genital aperture[*read* gonopods *for* genital aperture] have their coxae produced into long processes. These are often of a curious form, but do not seem constant in this. The fourth and even fifth coxae [*insert* in front of the gonopods] have small processes."

Little is known about the variation in the shape of the coxal processes that Wood referred to. In a specimen from Tallahassee, Florida, the coxal processes of the fourth legs are almost as long as those of the fifth legs, and the apical region of the sixth coxal processes is well distended laterad. Chamberlin's *palustris* from the Okefenokee Swamp, Georgia, differs in bearing at the apex of the narrow coxal processes of the fourth legs a "much narrower and paler mammiliform process." In neither of these cases of variation of coxal lobes is enough known to justify specific or subspecific designation at this time.

Chicobolus jucundus, new species

Spirobolus uncigerus Wood. McNeill, 1887. Proc. U.S. Natl. Mus. 10:325.

This species is distinguished from *C. spinigerus* by the even width of the lateral bands and by the undulate ventral margin of the coxae of the anterior gonopods.

MALE HOLOTYPE. Greenish black, with the hindbelts light green except across the dorsum, where they are reddish brown; antennae and margins of anal valves brown; front margin of head light brown; legs red. *Width* 6 mm.; *length* about 61 mm.; 51 *segments,* 1 legless. *Setigerous labral foveolae* 5+5. Ocelli flat, in 7 rows of 6, 7, 7, 6, 5, 4, 2. Mandibular cheeks, collum, and keels of second segment as in *C. spinigerus.* Surface shining, with very small

puncta. Segmental furrows continued very faintly across dorsum, but not impressed. Hindbelts without serrae at ends of ventral striae. Caudal tergite with a horizontal depression; apex rounded, depressed; ratio of caudal tergite to anal valves, as viewed from above, about 5:1. Coxae of legs 4 through 7 conspicuously produced, with the distal region of none closely appressed to its mate along the medial line. Seventh coxal processes less massive than in *C. spinigerus,* but similar in shape; ventral and cephalic surfaces invaginated. Sixth coxal processes much shorter than seventh, robust, a little distended laterad, ventral surface obliquely truncate, with anterior margin lowest. Fifth coxal processes have apical region rounded, flattened, bent sharply caudad; distinctly longer than the seventh processes. Fourth coxal processes similar to fifth, but a little shorter and narrower and not bent so sharply caudad. Coxae of third legs produced slightly ventrad in full, rounded processes.

The gonopods are similar to those of *C. spinigerus* except that the ventral margin of the coxae of the anterior pair is undulate, and the apex of the free inner piece of the posterior pair is a little broader.

FEMALE PARATYPE. Color, mandibular cheek, keels, etc. as in the male. *Width* 7 mm.; *length* about 57 mm.; 48 *segments,* 1 legless. *Setigerous labral foveolae* 4 + 4. *Ocelli* in 7 rows of 7, 8, 7, 7, 6, 5, 4.

Type locality: Pensacola, Escambia County, Florida; male holotype and three female paratypes collected Dec. 12, 1954, by Mr. Norman E. Savelle. McNeill (1887) reported it as common there in the neighborhood of swamps.

Type material: The holotype and a female paratype will be deposited in the American Museum of Natural History, and the remaining paratypes will be retained by the author.

Bollman's *Spirobolus pensacolae* has not appeared in my collections from Pensacola. It undoubtedly is a species of *Narceus,* as indicated by his description of the antennae as short, not quite reaching the posterior margin of the collum; the segments as moderately rough; and the species, in general, as "more related to *marginatus* than to any other of our North American species." In my collection there is a larva from Mobile County, Alabama, that has been assigned tentatively to this species.

Californibolus Verhoeff

Californibolus Verhoeff, 1944, Bull. Southern California Acad. Sci. 43:2:54-55; Chamberlin, 1949, Jour. Washington Acad. Sci. 39(5):165.

Resembles *Narceus* and *Chicobolus* in size, in the absence of scobinae, and in the position of the repugnatorial pores. Differs in having a smoother surface and a shorter caudal tergite. Other generic characters are given in the key to genera.

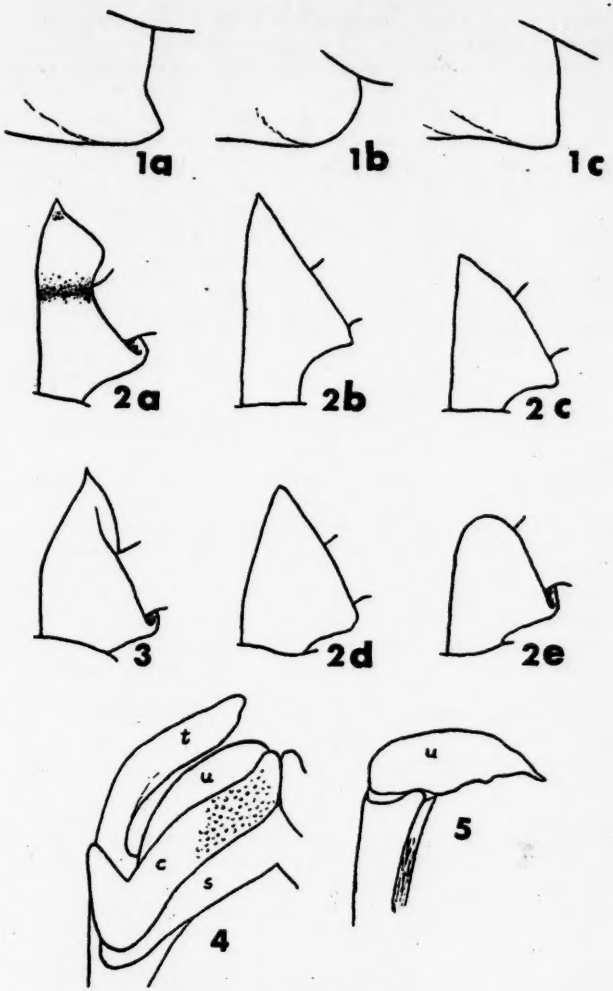
Generotype: *Californibolus michelbacheri* Verhoeff.

Californibolus fredricksoni, new species

Figures 1c, 4, 5

Spirobolus uncigerus Wood. Cragin, 1885, Bull. 4, Washburn Lab. Nat. Hist. pp. 143-145 (Shawnee Co., Kansas); [*?*] Kenyon, 1893, Proc. Nebraska Acad. Sci. p. 16 (Cass Co., Nebraska).

This species closely resembles *Californibolus uncigerus* (Wood) in the appearance of the anterior gonopods, but it is easily distinguished by the



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1. Outline of anterio-ventral margin of mandibular cheek of male. a. *Narceus marginatus*, Morris Co., N. J. b. *Chicobolus spinigerus*, Everglades Natl. Pk., Fla. c. *Californibolus fredricksoni*, Douglas Co., Kan.
2. Outline of coxal lobe of right legs of *Narceus tinctorius*, Powell Co., Ky. a. Third, cephalic surface. b. Fourth. c. Fifth. d. Sixth. e. Seventh.
3. Outline of coxal lobe of right third leg, cephalic surface, of *Narceus marginatus*, Morris Co., N.J.
4. Left gonopods, cephalic surface, of *Californibolus fredricksoni*. *c*, coxa; *s*, sternum; *t*, telopodite; *u*, ultimate article of posterior gonopod.
5. Distal region of left posterior gonopod, cephalic surface, of *C. fredricksoni*.

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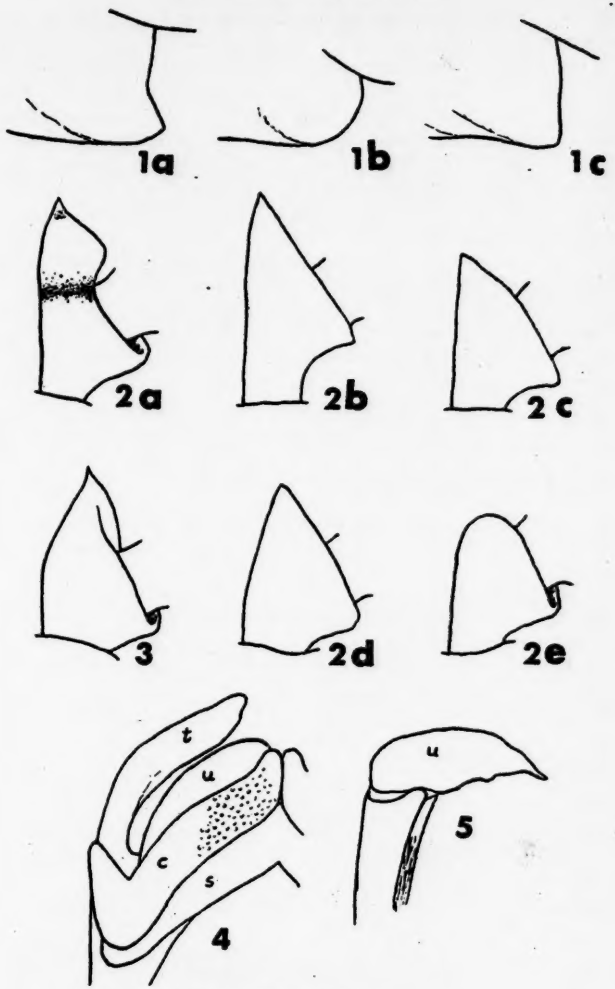

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5. Distal region of left posterior gonopod, cephalic surface, of *C. fredricksoni*.

absence of prickles on the cephalic surface of the ultimate article of the posterior gonopods.

MALE HOLOTYPE. Uniformly medium brown in preservative. *Width* 6.2 mm.; 58 *segments*, 1 legless. *Setigerous labral foveolae* 3 + 3. *Ocelli* in 6 rows of 5, 6, 5, 4, 3, 2(3). Antennal furrow on mandibular cheek depressed almost as much as in *Narceus* species. Ventral margin of cheek forms a sharp right angle, as shown in figure 1c. Marginal sutures of collum begin at height of eyes. Keels of second segment slightly shorter and thicker than in *Narceus* species. Tergites shining, finely coriaceous, without evident puncta. Segmental furrows continued very faintly over dorsum, but without depression. An indistinct horizontal suture passes caudad from each repugnatorial pore. Hindbelts without serrae at ends of ventral striae. *Caudal tergite* without a horizontal depression; apex rounded, depressed; ratio of exposed length of caudal tergite and anal valves, as viewed from above, 3:2. *Coxae* of pregenital legs typical of the genus; third largest, blunt, uncinate, directed cephalad; fourth, fifth, and sixth produced in very short, rounded, somewhat flattened lobes.

The gonopods are shown in figures 4 and 5. The coxa of the anterior gonopods is narrower and the outer margin is not sinuous as in *uncigerus*, nor does the telopodite have the very small apical node that *uncigerus* has. The ultimate article of the posterior gonopods (Fig. 5) is shorter than in *uncigerus*, and the cephalic surface is free of prickles; in this character *fredricksoni* resembles *C. pontis* Chamberlin 1949. The caudal surface is typical of the genus.

Type locality: Douglas County, Kansas; male holotype collected Sept. 1, 1949, by Mr. R. W. Fredrickson, for whom the species is named.

Type material: Snow Entomological Museum, University of Kansas. A topotype will be deposited in the American Museum of Natural History.

In addition to the two known males, an immature female collected by Mr. Fredrickson in Monroe County, Iowa, July 5, 1950, has been tentatively assigned to this species. Except for these three specimens, Mr. Fredrickson's collection of spirobolids made over a period of several years in eastern Kansas consisted entirely of *Narceus oklahomae*.

The specimens of *C. uncigerus* used for reference were collected by Mr. Joe Gorman at Round Mountain and Low Pass Creek, Shasta County, California. The anterior gonopods differ from Wood's figure only in that the mesal margin of the coxites are contiguous. About half of the anterior surface of the ultimate article of the posterior gonopods is covered with prickles.

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